SELECTED WATER RESOURCES ABSTRACTS

VOLUME 7, NUMBER 13
JULY 1, 1974

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SELECTED
WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center,
Office of Water Resources Research, U.S. Department of the Interior

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The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus.** Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Resources Research
U.S. Department of the Interior
Washington, D. C. 20240

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03 WATER SUPPLY AUGMENTATION AND CONSERVATION
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2. WATER CYCLE

2A. General

LABORATORY EXPERIMENTS WITH SURFACE RUNOFF,
Alberta Dept. of Environment, Edmonton. Div. of Technical Services.
For primary bibliographic entry see Field 2E.
W74-06737

HYDROGEOMORPHOLOGY,
Technische Hochschule, Vienna (Austria). Institut fuer Geophysik.
A. E. Scheidegger.
Journal of Hydrology, Vol 20, No 3, p 193-215, November 1973. 4 fig, 75 ref.

Descriptors: *Geomorphology, *Reviews, *Erosion, Stream erosion, Degradation(Slope), *Hydrogeology, Degradation(Stream), Earthquakes, Seepage, Landslides, Slope stability, Pore water, Karst, Subsidence, Consolidation, Beach erosion, Sea level, Tsunamis, Turbidity currents.
Identifiers: *Hydrogeomorphology.

The current state of knowledge of the mechanical effects caused by water on the morphology of the Earth is reviewed. The mechanical interaction of surface water and groundwater with landscapes and the mechanical effects of the sea on coastal regions and on the ocean bottom are discussed. (Knapp-USGS)
W74-06891

ASSESSING SYSTEMATIC ERRORS IN RAINFALL-RUNOFF MODELS,
Snowy Mountains Engineering Corp., Cooma (Australia).
A. P. Aitken.
Journal of Hydrology, Vol 20, No 2, p 121-136, October 1973. 3 fig, 5 tab, 9 ref.

Descriptors: *Rainfall-runoff relationships, *Mathematical models, *Statistical methods, Correlation analysis.
Identifiers: *Error analysis.

The errors in estimated monthly flows from seven deterministic rainfall-runoff models were studied using results published in the literature. Various commonly used statistical tests were examined, but they did not disclose systematic errors which, by the application of other tests, were often found to exist. It was therefore concluded that hydrologists should test their results by applying a simple sign test and a measure of the reproduction of the residual mass curve referred to as the residual mass curve coefficient. (Knapp-USGS)
W74-06893

WALDEN'S WAY REVEALED,
Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 2H.
W74-06925

USE OF WASTE HEAT FOR SOIL WARMING IN NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering; and North Carolina State Univ., Raleigh. Dept. of Horticultural Science.
For primary bibliographic entry see Field 5D.
W74-07000

2B. Precipitation

CLIMATIC DATA OF THE HIGH ALTITUDE METEOROLOGICAL STATIONS OF THE GENEVA REGION FOR 1970, (IN FRENCH),
Conservatoire Botanique, Geneva (Switzerland).
For primary bibliographic entry see Field 7C.
W74-06532

COMPUTED ATMOSPHERIC EFFECTS ON ERTS OBSERVATIONS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
R. S. Fraser.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1567-1573, 1973. 7 fig, 3 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Calibrations, Radiation, *Aersols, *Water vapor, Solar radiation, Albedo.
Identifiers: *ERTS, *Radiance(Atmospheric).

The nadir radiances of many models of the earth-atmosphere system were computed for a fixed solar zenith angle. These data indicate that the standard deviations of the ERTS multispectral scanner responses to changes in water vapor and aerosols would be small on a continental-wide basis. (See also W74-06619) (Knapp-USGS)
W74-06694

AUTOMATIC PROCESSING AND VERIFICATION OF METEOROLOGICAL OBSERVATIONS.
Hydrometeorological Service of the USSR, Moscow.
Available from the National Technical Information Service as TT-72 50087, $3.75 in paper copy $1.45 in microfiche. Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries, 1971. 77 p. Translated from Russian, Jerusalem, Israel. Program for Scientific Translations Technical Translation. TT-72-50087, 1973.

Descriptors: *Data processing, Hydrologic data, *Climatic data, *Meteorological data, Computer programs, Data collections, Quality control, *Automatic control.
Identifiers: *USSR.

The Moscow symposium is the first international conference devoted to the automatic control of climatological data. As a result of work undertaken by the WMO, this problem was first discussed at an international symposium on climatological data processing, held in 1968 at Asheville (USA). Climatologists have turned their attention to the problem only in recent years, when computers were used to solve climatological problems. (See W74-06723 thru W74-06733).
W74-06722

MACHINE CONTROL OF THE QUALITY OF OBSERVATIONS IN AUTOMATED HYDROMETEOROLOGICAL-DATA PROCESSING,
N. K. Klyukin.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72 50087, p 1-3, 1973. 1 fig.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs.
Identifiers: USSR.

In an automated data processing system quality control should be implemented at the beginning of the technological process, after a sufficient amount of data have been received. In most cases doubtful data detected by the computer will have to be analyzed by specialists, insuring to some extent that subsequent processing stages will employ only reliable data. Until objective computer-based control methods are fully developed and assimilated it will be necessary to control the quality of key data at subsequent processing stages, particularly when conducting statistical investigations. (See also W74-06722) (Knapp-USGS)
W74-06723

FUNDAMENTALS OF AUTOMATIC CONTROL OF METEOROLOGICAL DATA,
V. V. Filippov.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72 50087, p 4-11, 1973.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, *Automatic control.
Identifiers: USSR, *Errors.

Computer control of the quality of meteorological data is implemented by means of programs which compare observed values of meteorological elements with independent estimates. The quality of information is estimated by the measure of the admissible discrepancy between the observed values and their independent estimates determined numerically or by means of other measurement techniques. The ideal program must satisfy the following basic conditions: (1) all observed parameters must be checked with the same degree of reliability; (2) control must be absolute, i.e., discovery of all errors independently of their size and origin; and (3) automatic control must be more thorough and cheaper than manual control. Besides their immediate value, the results of quality control can be very useful in the inspection of a meteorological network. (See also W74-06722) (Knapp-USGS)
W74-06724

AUTOMATIC CHECK AND CORRECTION OF METEOROLOGICAL DATA IN EAST GERMANY,
H. Kase, and B. Antonik.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72 50087, p 12-19, 1973. 2 fig, 4 ref.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, Automatic control.
Identifiers: *Germany.

Meteorological information is collected and processed in accordance with specific instructions and programs. Such repetitive processes are very convenient for automation. The data control and correction subsystem used in East Germany is described. The following meteorological quantities are measured by the automatic remote-control meteorological station: mean wind speed (integration time 10 minutes); maximum wind speed (integration time 1.5 sec); average wind direction (integration time 10 minutes); total rainfall; rain duration; number of lightning discharges in a 15-km radius; global radiation; air temperature; soil temperature at depths of 5, 10, 20, and 50 cm; air pressure; dew point; and psychrometric difference. In computer control by means of logi-

cal relations, data contained in the meteorological journal serve as initial data. The check is based on specified limiting values or combinations determined by observations. The control input parameters are air temperature, water vapor content in air, air pressure, horizontal visibility at ground level, cloudiness, soil state, weather state, and wind. (See also W74-06722) (Knapp-USGS)
W74-06725

COMPUTER MONITORING OF PRECIPITATION IN HUNGARY,
L. Adami.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Counties: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72 50087, p 20-21. 1973.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, *Climatic data, Monitoring, Precipitation(Atmospheric).
Identifiers: *Hungary.

The rainfall data supplied by the comparatively dense network of stations covering the territory of Hungary are controlled daily and processed manually, and precipitation charts are prepared. This processing is time- and labor-consuming: each month it is necessary to copy and calculate about 40 million items of data, and at times to recalculate them. Accordingly, the data processing section of the Hungarian Meteorological Service has been conducting numerical experiments in computer control and processing of daily precipitation data since November 1966. The computer not only implements control, but also plots daily precipitation charts and prepares tables containing the results of statistical processings. The output includes the following data: checked sum of daily and monthly precipitation for each station; deviations from the norms; chart of distribution of precipitation by days and months; days with given sums of precipitation; days with snow and with storms and hail; and yearly conclusions. (See also W74-06722) (Knapp-USGS)
W74-06726

AUTOMATIC MONITORING OF DAILY RESULTS OF BASIC METEOROLOGICAL OBSERVATIONS,
I. V. Nazarova.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries Jerusalem, Israel Program for Scientific Translation Technical Translation TT-72 50087, p 22-30, 1973. 3 fig, 5 tab.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, *Automatic control, Climatic data, Monitoring.
Identifiers: *USSR.

Methods were developed in the USSR for automatically monitoring basic meteorological observations: air temperature (periodical, maximum, minimum), soil surface temperature (periodical, maximum, minimum), atmospheric humidity, dew point, atmospheric pressure, wind direction and speed, aurora duration, snow cover, precipitation, amount the form of clouds, atmospheric effects, visibility, weather and soil surface state. Random errors are found by examining the daily data. Methods of detecting random errors and coarse blunders are discussed. Each observed quantity is first compared with the boundaries of climatic limits and the codes. If these conditions are not fulfilled, the given quantity is no longer controlled, and the computer prints the number of the error which is analyzed and corrected by specialists. If the conditions are fulfilled, a more accurate control, different for the various meteorological elements, is conducted. (See also W74-06722) (Knapp-USGS)
W74-06727

AUTOMATIC METHOD OF MONITORING THE QUALITY OF MEAN MONTHLY METEOROLOGICAL DATA,
D. P. Bespalov, and I. A. Berlin.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72 50087, p 31-35, 1973. 1 tab.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, *Automatic control, Monitoring.
Identifiers: *USSR.

In the automated monitoring of data at the USSR Hydrometeorological Service, all meteorological data to be recorded on a carrier for later utilization pass necessarily through two control stages. The first stage involves examination of coarse errors (miscalculations and distortions) in routine data, which were caused mainly by data distortion in the communication lines, and also during punching and data decoding. In the second stage the results are analyzed for uniformity and compatibility and searched for systematic errors. This stage represents quality analysis of the observation results. Random errors, technical miscalculations, and distortions in the communication channels are usually detected fairly simply by a careful examination of the observation results, and are either corrected or eliminated from subsequent use while preparing the results for monthly generalizations. (See also W74-06722) (Knapp-USGS)
W74-06728

AUTOMATIC MONITORING OF PROCESSING OF DAILY RADIOSONDE DATA ON TEMPERATURE AND GEOPOTENTIAL,
I. V. Khanevskaya.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72-50087, p 36-49, 1973, 2 fig, 4 tab, 7 ref.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, *Automatic control, Monitoring, *Radiosondes, Temperature.
Identifiers: *USSR.

At present the Hydrometeorological Service of the USSR implements a scheme of automatic processing of daily aerological observations. Aerological observations, punched on paper tape, are received during the first days of each following month at the Regional Centers. The results are read into the computer, decoded, and formed into a matrix. Control and correction of erroneous values of the elements in the matrices are followed by calculation of the required overall monthly characteristics with printout of daily and overall data and their recording on a permanent carrier. (See also W74-06722) (Knapp-USGS)
W74-06729

AUTOMATIC MONITORING AND PROCESSING OF HOURLY HYDROMETEOROLOGICAL INFORMATION,
Z. M. Makhover, and V. V. Ovsyannikov.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72 50087, p 50-58, 1973. 4 fig, 4 tab, 3 ref.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, *Automatic control, Monitoring.
Identifiers: *USSR.

Hourly meteorological observations are conducted at the meteorological stations of airports in the USSR for operational purposes and cover the main characteristics necessary for serving aircraft. These observations are also of great scientific value since they yield the most detailed time structure of the series of observations. The computer system for automatic control and processing of hourly meteorological information includes the following main stages: Punching of observation results on teleprinter tape, which is then forwarded monthly to the Regional Center for processing; input of the punched tape into a computer, which processes and monitors the data; and output of tables of hourly observations, summary tables, and data recording on microfilm for lengthy storage. About 45-50 minutes machine time are taken for monitoring and processing of the monthly file of hourly data of a given station; when microfilming is included in the process this time increases to 1.5 hr. The following advantages are achieved by the automation of monitoring and processing: no manual labor is needed for filling and checking tables; monitored and processed data are obtained, including summary data; monitored data are recorded on a permanent medium (microfilm); the time taken for processing and recording data on the permanent medium is reduced considerably; considerable savings are achieved. This system was tested at the Belorussian Territorial Center and the Western Siberian Regional Center and was found viable and easy to operate. (See also W74-06722) (Knapp-USGS)
W74-06730

SOME PRINCIPLES OF OBJECTIVE CONTROL OF MARINE METEOROLOGICAL INFORMATION,
B. A. Birman, and A. S. Kaganskii.
In: Automatic Processing and Verification of Meteorological Observations: Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72 50087, p 59-61, 1973. 1 ref.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, *Marine air masses.
Identifiers: *USSR.

Marine meteorological observations, unlike other standard meteorological observations, are irregular with the exception of data originating from a small number of weather ships and lighthouses. Marine meteorological information is received at the Center of Statistical Data Processing and Storage of the USSR in the form of synoptic telegrams and observer's logs, and is processed and controlled automatically. Due to the irregularity of marine meteorological observations, spatial control is best implemented according to some quasi-homogeneous regions within which differences between the meteorological elements are of a random nature. A study conducted for the Gulf Stream convergence zone and the Labrador currents established that in a square of 10 deg X 10 deg a fully homogeneous air temperature field was recorded in 12% of cases, and in a square 5 deg X 5 deg in 26% of cases. The air mass propagating over a 2 deg X 2 deg square was in 50% of cases fully temperature-homogeneous in the marine surface layer, while in a 1 deg X 1 deg square this was true in 70 cases out of 100. Analysis of the homogeneity of the air temperature field on the basis of long-

term data established that a 2 deg X 5 deg area forms a quasi-homogeneous water area in this part of the Atlantic Ocean. (See also W74-06722) (Knapp-USGS)
W74-06731

AUTOMATIC PROCESSING OF RAINFALL DATA,
R. L. Kagan, and A. I. Polishchuk.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72-50087, p 62-68, 1973. 2 fig, 12 ref.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, Meteorological data, Computer programs, *Weather data, Climatic data, *Rainfall, *Automatic control.
Identifiers: *USSR.

Systematic errors in meteorological data may be found with sufficient reliability by spatial interpolation. However, there are meteorological elements, such as the amount of rainfall, for which the results are less satisfactory. Control of meteorological data by spatial interpolation/may be reduced to the determination of the discrepancy between the observed value of the element and that obtained by interpolation from data of the surrounding stations. If this discrepancy exceeds some specified value, the observation is considered doubtful. This specified value must be much higher than the discrepancies caused by the natural spatial variability in error-free observations. For the monthly precipitation sums the mean square discrepancy of the interpolation is near to the tolerance adopted at present, and as a result roughly one-third of the data lie beyond its limits. Thus, for the monthly rainfall over the territory of the central regions of European USSR it represents 32% of the mean value. Similar results were also obtained for the territory of Belorussia. The density of the rainfall-measuring network in the Soviet Union is not uniform, but a density of 1 station per 2,000 sq km can be considered near its average density over the whole territory. (See also W74-06722) (Knapp-USGS)
W74-06732

AN ALGORITHM FOR MONITORING HYDROMETEOROLOGICAL INFORMATION,
I. A. Dyubkin.
In: Automatic Processing and Verification of Meteorological Observations; Proceedings of the International Symposium of Hydrometeorologists from the Socialist Countries: Jerusalem, Israel Program for Scientific Translations Technical Translation TT-72 50087, p 69-75, 1973. 1 tab, 10 ref.

Descriptors: *Data processing, *Hydrologic data, *Quality control, Data collections, *Meteorological data, Computer programs, *Algorithms, Monitoring.
Identifiers: *USSR.

Studies on the automation of all stages of hydrometeorological data flow, starting with the observations and ending with the delivery of data to the customer, are conducted at the Hydrometeorological Service of the USSR. One component of the automation system is data control, the correction or rejection of erroneous data. The most widely used methods of automatic control are static methods, based on the barometric height formula, and optimal interpolation, involving data on the statistical structure of analyzed hydrometeorological elements. This method is quite efficient in regions with a dense network of stations. One shortcoming of this objective control of observational results is the subjectivity in selecting the critical discrepancy between observed and controlled values. One possible algorithm for finding coarse observation errors in related hydrometeorological series is based on the mathematical-statistical principle of the impossibility of implementing a phenomenon with a small occurrence probability in a single test. The statistical structure of the observed quantities and their derivatives is examined. The diurnal and seasonal cycle is eliminated. The quasi-steady averaging periods and the locally-homogeneous regions are determined. The control algorithms are constructed allowing for the characteristics of the variability of the analyzed element by seasons and regions. The suggested control algorithms for hydrometeorological elements were constructed with allowance for data on the natural variability of the analyzed parameters and are applicable to a sparse network of nonuniformly distributed stations. (See also W74-06722) (Knapp-USGS)
W74-06733

ANALYSIS OF THE CONCENTRATION OF MICROPARTICLES IN THE LONG ICE CORE FROM BYRD STATION,
Ohio State Univ., Research Foundation, Columbus. Inst. of Polar Studies.
For primary bibliographic entry see Field 2C.
W74-06931

UNIVERSITY OF CHICAGO CONTRIBUTION TO PROJECT METROMEX-I.
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
Available from NTIS, Springfield, Va. 22151 as PB-218 678; $3.00 printed copy, $1.45 microfiche. Cloud Physics Laboratory Technical Note 45 (Final technical report to the National Science Foundation), R. R. Braham, Jr., editor, December 15, 1972. 101 p. NSF Grant GA 28190X1.

Descriptors: *Cities, *Precipitation(Atmospheric), *Weather modification, *Chemistry of precipitation, Aerosols, Urban hydrology, Nucleation, *Missouri.
Identifiers: Urban precipitation anomaly, *St. Louis(Mo).

Measurements made over and around St. Louis, Missouri show that the city markedly affects several atmospheric parameters important in the formation of clouds and weather. The city acts as a source of cloud condensation nuclei (CCN) with a source strength of 5000 to 50,000 per cc per sec. This increase in CCN concentrations results in downwind clouds with smaller, more numerous drops at cloud base. Vertical cross-sections of state parameters and aerosol were used to study the vertical structure of the urban heat island and urban aerosol plume. Radar mapping of precipitation echoes verifies the presence of an urban precipitation anomaly. (See W74-06938 thru W74-06941) (Knapp-USGS)
W74-06937

RADAR STUDIES OF URBAN PRECIPITATION ANOMALY,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
M. Dungey, and T. R. Morris.
In: University of Chicago Contribution to Project Metromex-I: Chicago University Cloud Physics Laboratory Technical Note 45 (Final technical report to the National Science Foundation), p 25-33, December 15, 1972. 4 fig, 3 tab.

Descriptors: *Cities, *Precipitation(Atmospheric), *Weather modification, *Chemistry of precipitation, Aerosols, Urban hydrology, Nucleation, *Missouri, *Remote sensing, Radar.
Identifiers: Urban precipitation anomaly, *St. Louis(Mo).

Radar data show that precipitation initiation in the St. Louis are during June-August 1972 was predominantly through drop coalescence. The area over and downwind of the city had about 2.4 times the frequency of precipitation initiation of the non-city area. A larger fraction of the city echoes grew after formation. On the average the First Echo (FE) base and top heights were about equal over the city and non-city, although the cumulative frequency distribution show a skewing toward higher bases and tops for city FE. The frequency of no-echo observations is about three times higher over the city than over the non-city. This fact combined with more frequent FE formation suggests that a combination of two urban agents is at work--one of which increases the likelihood of precipitation formation over the downwind of the city, and a second reduces the total area over which precipitation reaches the ground. (See also W74-06937) (Knapp-USGS)
W74-06938

OBSERVATIONS OF THE CLOUD NUCLEUS CONCENTRATION AROUND THE ST. LOUIS URBAN COMPLEX,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
P. Spyers-Duran.
In: University of Chicago Contribution to Project Metromex-I: Chicago University Cloud Physics Laboratory Technical Note 45 (Final technical report to the National Science Foundation), p 35-52, December 15, 1972. 10 fig, 2 tab, 16 ref. NSF Grant GA 28190X1.

Descriptors: *Cities, *Precipitation(Atmospheric), *Weather modification, *Chemistry of precipitation, Aerosols, Urban hydrology, Nucleation, *Missouri.
Identifiers: Urban precipitation anomaly, *St. Louis(Mo).

In summer 1971, winter 1972, and summer 1972, a highly industrialized and populated area (St. Louis) produces cloud condensation nuclei (CCN) significantly above background concentrations. Downwind, the CCN plume is identifiable for at least one diameter of the urban area. Maximum concentrations typically were found immediately downwind; a secondary maximum might exist 30-35 miles downwind of the city. The production rates of CCN are similar to those of other cities including Denver and Buffalo, and lower production rates exist on Sundays. (See also W74-06937) (Knapp-USGS)
W74-06939

UPWIND AND DOWNWIND CLOUD-BASE MICROSTRUCTURE,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
P. Spyers-Duran.
In: University of Chicago Contribution to Project Metromex-I: Chicago University Cloud Physics Laboratory Technical Note 45 (Final technical report to the National Science Foundation), p 53-71, December 15, 1972. 15 fig, 3 tab, 11 ref. NSF Grant GA 28190X1.

Descriptors: *Cities, *Precipitation(Atmospheric), *Weather modification, *Chemistry of precipitation, Aerosols, Urban hydrology, Nucleation, *Missouri.
Identifiers: Urban precipitation anomaly, *St. Louis(Mo).

Cloud base microstructure is controlled to a large extent by the updraft speed and the subcloud condensation nuclei (CCN) spectra. Clouds forming in high CCN concentrations form a narrow spectra of small drops compared with those forming from low CCN concentrations. The ability of clouds to produce precipitation through coalescence is related to their cloud drop spectra. In general the initial 'breakout' of precipitation elements is delayed in narrow spectrum clouds. Because St. Loius typically serves as a source of CCN, the microstructure of clouds around the city was studied to verify that they show response to the urban-induced cloud condensation nuclei. Over the city and

downwind, clouds are composed of smaller and more numerous droplets and have smaller dispersion than the upwind clouds. This increase in continentality of the microstructure in the effected clouds results in colloidal stability and hence could lower the probability of producing precipitation. Downwind clouds, in about a distance of the city diameter, approach again the upwind cloud microstructure. (See also W74-06937) (Knapp-USGS)
W74-06940

METROMEX TEMPERATURE AND AEROSOL DATA REDUCTION: ANALYSIS OF THE URBAN ANOMALY,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
H. E. Dytch.
In: University of Chicago Contribution to Project Metromex-I: Chicago University Cloud Physics Laboratory Technical Note 45 (Final technical report to the National Science Foundation), p 73-90, December 15, 1972. 12 fig. NSF Grant GA 28190XI.

Descriptors: *Cities, *Precipitation(Atmospheric), *Weather modification, *Chemistry of precipitation, Aerosols, Urban hydrology, Nucleation, *Missouri.
Identifiers: Urban precipitation anomaly, *St. Louis(Mo).

Flights over the St. Louis area were designed to study in detail the influence of an urban center upon its meteorological environment, continuously measuring state parameters and aerosol distribution in vertical cross-sections at selected flight levels over the city. Infrared surface temperature measurements were also conducted during the winter of 1972, mapping in detail an approximately 2,500 sq km region centered on the St. Louis metropolitan area. A high temperature pocket, centered on downtown St. Louis just west of the Gateway Arch stands out clearly, with a maximum temperature difference from the outlying northern rural area in excess of 5 deg C. Topographical effects, associated possibly with cold-air drainage, also are evident but close to the city the temperature field appears to be dominated by the urban effect. In terms of both particle concentration and density the urban area appears as a strong source of contamination, and the confining effect of the upper level inversion is marked. (See also W74-06937) (Knapp-USGS)
W74-06941

THE ROLE OF DEW IN THE SEASONAL MOISTURE BALANCE OF A SUMMER-DRY CLIMATE,
Victoria Univ. (British Columbia). Dept. of Geography.
S. E. Tuller, and R. Chilton.
Agric Meteorol. Vol 11, No 1, p 135-142. 1973.
Identifiers: *Dew, *Dry climates, Evapotranspiration, *Moisture balance, Seasonal, Summer, Transpiration.

The role of dew in the moisture balance of a summer-dry climate was investigated. Dew was measured by means of the optical technique employing Duvdevani dew blocks during 3 summer months and one fall month in 1970. Results were compared with rainfall and potential evapotranspiration. Dew amounted to 12-14% of normal monthly rainfall in mid-summer. In the unusually dry year of 1970 it reached 154% of the rainfall in Aug. Dew was seen to increase with the number of clear nights and thus, increased as clouds and precipitation decreased. Although dew was an available source of evaporative moisture until approximately 09h30 on the morning after a clear night, its total was only about 2% of monthly potential evapotranspiration. The amount of dew increased outward from a vertical forest edge as longwave cooling and wind effects increased.--Copyright 1973, Biological Abstracts, Inc.
W74-07037

ENERGY FLOWS IN THE BIOSPHERE: THE IMPACT OF MAN,
Australian National Univ., Canberra. Research School of Biological Sciences.
R. O. Slatyer.
Proc Linn Soc N S W. Vol 97, No 3, p 225-236. 1972.
Identifiers: *Biosphere, Climates, Cycling, Electric power, *Energy flows, Food, Insulation, Photosynthesis, Planned obsolescence, Power production, Solar energy, *Ecosystems, *Energy balance.

The way in which energy underlies the workings of the biosphere, the workings of the natural ecosystems and the workings of human societies is discussed. Solar energy is of fundamental importance to the global environment, and the patterns of weather and climate reflect a delicate balance between the inflows, outflows and redistributions. National ecosystems are powered by solar energy through photosynthesis, and there is a tendency for their energy storage and species diversity to increase with succession. Human activity is linked to energy consumption, and the tendency is to use more and more energy per person. Any significant change in the energy balance is likely to affect the climate, and small effects on climate could have serious effects on food production. The challenge for the future is to produce and use energy as efficiently as possible, and with the least possible ecological disturbance. Some possible methods to do this include: recycling, extensive use of hydro-electric power, better insulation in structures and a change of the Western life style with its emphasis of endless production and planned obsolescence.--Copyright 1973, Biological Abstracts, Inc.
W74-07043

DRY AND WET, JULY-AUGUST RAINFALL AREAS IN IOWA,
Iowa State Univ., Ames. Dept. of Agronomy.
R. H. Shaw, and P. J. Waite.
Iowa State J Res. Vol 47, No 3, p 191-198. 1973. Illus.
Identifiers: Clouds, *Crop production, Dry season, *Iowa, *Rainfall, Seeding, Wet season.

July and Aug. rainfalls in Iowa, coinciding with the peak of heating and evapotranspiration, are especially critical for crop production. Consequently, areal and temporal evaluations of the characteristics of rainfall in Iowa during those months in 1931-1970 was undertaken to provide a climatological analysis for the potential effects of cloud seeding on crop production. Dry areas during July-Aug. in Iowa were observed in 27 of 40 yr (i.e., 2 of 3) and wet areas were observed in 35 of 40 yr (7 of 8); both wet and dry areas were present in more than half the years (22 of 40). Iowa does not experience an increased number of low-rainfall days during dry spells, but experience an actual decreased number of rain days at all rainfall threshold values of 0.01, 0.1, 0.25 and 0.5 in.--Copyright 1973, Biological Abstracts, Inc.
W74-07045

2C. Snow, Ice, and Frost

NEW INSIGHTS INTO THE INFLUENCE OF ICE ON THE COASTAL MARINE ENVIRONMENT OF THE BEAUFORT SEA, ALASKA,
Geological Survey, Menlo Park, Calif. Office of Marine Geology and Hydrology.
P. W. Barnes, and E. Reimnitz.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1307-1314, 1973. 5 fig, 11 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Sea ice, *Alaska, *Geomorphology, Surveys, Data collections, Water circulation, Sedimentation, Sediment transport.
Identifiers: *ERTS.

Areal patterns from field data and ERTS-1 imagery show a close relationship between geomorphic processes and the influence of sea ice along Alaska's northern coast, perhaps the nation's least known continental margin. Ice acts as (1) a bottom-gouging agent, (2) an influence on water circulation, (3) a carrier of sediments, and (4) an influence on water types. (See also W74-06619) (Knapp-USGS)
W74-06669

USE OF ERTS DATA FOR MAPPING ARCTIC SEA ICE,
Environmental Research and Technology, Inc., Lexington, Mass.
J. C. Barnes, and C. J. Bowley.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1377-1384, 1973. 7 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Sea ice, *Mapping, Surveys, Monitoring, Data collections, Icebergs, Ice, Arctic, Glaciers, Snowpacks.
Identifiers: *ERTS.

ERTS data were evaluated for detecting and mapping Arctic sea ice. The specific objectives are to determine the spectral bands most suitable for detecting ice, to measure the scale and types of ice features that can be detected, and to develop interpretive techniques for differentiating ice from clouds and for mapping ice concentrations. Sea ice is detectable in all of the ERTS MSS spectral bands and can be distinguished from clouds through a number of interpretive keys. The MSS-4 (0.5 to 0.6 micron) and MSS-5 (0.6 to 0.7 micron) bands appear to be better for mapping ice boundaries, whereas the MSS-7 (0.8 to 1.1 micron) band provides greater detail in the ice features. Considerable information on ice type can be derived from the ERTS data. Ice types that appear to be identifiable include: ice flows of various categories, pack ice of various concentrations, ice belts, brash ice, rotten ice, fast ice, leads, fractures, cracks, puddles, thaw holes and flooded ice. The multispectral analysis of the ERTS MSS-4 and MSS-7 bands provides much information on ice type and ice surface features that cannot be derived from a single spectral band. For example, thaw holes can often be distinguished from puddles because of their different appearances in the two bands. These surface features can be indicative of ice age. Furthermore, snow lines on glaciers can be reliably mapped through the joint use of the MSS-4 and MSS-7 data. (See also W74-06619) (Knapp-USGS)
W74-06676

SNOW COVER SURVEYS IN ALASKA FROM ERTS-1 DATA,
Alaska Univ., College.
C. S. Benson.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1593-1595, 1973.

Descriptors: *Remote sensing, Satellites(Artificial), *Snow cover, *Ice, *Glaciers, Snowpacks, *Alaska, Surveys, Melting, Mapping, Data collections.
Identifiers: *ERTS.

September and October, 1972, ERTS data were analyzed to delineate snow cover patterns in northern Alaska's Brooks Range and on Mt. Wrangell, an active volcano in south central Alaska. Snow on the northern foothills of the Brooks Range is significantly more affected by katabatic wind action than on the southern foothills. Aufeis deposits along artic rivers also can be identified in late summer. A survey of such aufeis deposits could identify additional summertime sources of freshwater supplies. Images of Mt. Wrangell monitor the interaction between volcanic heat and the mass balance of glaciers. Significant melting of new snow from an extensive storm on August 18 was seen. Digital analysis of data from subsequent passes over the summit on September 7, 23 and 24 reveal considerable bare rock exposed by melting, which is virtually impossible from solar heating at this altitude and date. (See also W74-06619) (Knapp-USGS)
W74-06697

RECENT ACTIVITY OF GLACIERS OF MOUNT RAINIER, WASHINGTON,
Geological Survey, Reston, Va.
R. S. Sigafoos, and E. L. Hendricks.
Available from Sup Doc, GPO, Washington, D C 20402, Price $5.70. Geological Survey Professional Paper 387-B, 1972. 24 p, 13 fig, 7 plate, 10 tab, 21 ref.

Descriptors: *Glaciers, *Washington, *Dendrochronology, *Paleoclimatology, Glacial drift, Quaternary period, Pleistocene epoch, Dating, Glacial sediments, Geomorphology.
Identifiers: *Mount Rainier(Wash).

Moraines on Mt. Rainer, Washington, can be dated by knowing the ages of trees. Knowing past glacial activity aids understanding of past climatic variations. There are modern moraines of different age around the mountain; some valleys contain only one modern moraine; others contain as many as nine. The evidence indicates a sequence of modern glacial advances terminating at about the following A.D. dates: 1525, 1550, 1625-60, 1715, 1730-65, 1820-60, 1875, and 1910. Nisqually River valley near Nisqually Glacier contains one moraine formed before A.D. 1842; Tahoma Creek valley near South Tahoma Glacier contains three moraines formed before A.D. 1528, 1843, and 1864; South Puyallup River valley near Tahoma Glacier, six moraines, A.D. 1544, 1761, 1841, 1851, 1863, 1898; Puyallup Glacier, one moraine, A.D. 1846; Carbon Glacier, four moraines, 1519, 1763, 1847, 1876; Winthrop Glacier, four moraines, 1655, 1716, 1760, and 1822; Emmons Glacier, nine moraines, 1596, 1613, 1661, 1738, 1825, 1850, 1865, 1870, 1901; and Ohanapecosh Glacier, three moraines, 1741, 1846, and 1878. Outwash in three areas was deposited by melt-water of Tahoma Glacier before A.D. 1862, 1873, and 1910, respectively. Flood channels or melt-water channels on either side of Carbon River near Carbon Glacier dated from about 1901 to 1907. Melt-water channels of three different ages cut through Emmons Glacier moraines were dated as being abandoned before 1865, 1871, and 1917, respectively. (Knapp-USGS)
W74-06713

INVESTIGATIONS PERFORMED ON THE ARCTIC ICE DYNAMICS JOINT EXPERIMENT, MARCH 1971,
Cold Regions Research and Engineering Lab., Hanover, N.H.
S. F. Ackley, W. D. Hibler, III, A. Kovacs, W. F. Weeks, and A. Hartwell.
Research Report 315, December 1973. 66 p.

Descriptors: *Sea ice, *Ice cover, *Cryology, Deformation, Topography, Strain, Stress, Movement, Winds, Currents(Water), Plastic deformation, Aerial photography.
Identifiers: *Pack ice, *Beaufort Sea, Ice dynamics.

Mesoscale strain measurements were made on the Beaufort Sea pack ice. Fracture (lead and crack) orientations in first-year ice indicate correlation with the orientation of the strain rate ellipse. A qualitative relation is suggested between the fracture density and the long-term divergence rate. Correlation was also observed between the divergence of the wind field, as computed from the surface pressure field, and the ice divergence. Three transverse profiles were measured across a large pressure ridge in the Beaufort Sea. The ridge sail extended 4 m above sea level and the keel 13 m below. The cross sections of the keel were roughly semicircular, suggesting that form drag coefficients for flow transverse to the long axes of multiyear ridges may be as high as 0.8. A spectral study of the snow and ice topography of a multiyear floe showed that the snow cover attenuates the roughness amplitude of the ice surface but does not cover it completely. The ice sheet as a whole is in free-floating, isostatic equilibrium, but pronounced local deviations from isostatic equilibrium are common. The time, direction and magnitude of deformational motion in the Beaufort Sea were determined by combining observations of the changes in features related to ice deformation (leads, fractures, pressure ridges) with mesoscale measurements of strains and strain rates on the ice. Measurements of the size of ice blocks in newly formed pressure ridges and measurements of salinity and temperature are presented. (See W74-06717 thru W74-06721) (Knapp-USGS)
W74-06716

MESOSCALE STRAIN MEASUREMENTS ON THE BEAUFORT SEA PACK ICE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
W. D. Hibler, III, W. F. Weeks, S. Ackley, A. Kovacs, and W. J. Campbell.
In: Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971: Army Cold Regions Research and Engineering Laboratory Research Report 315, Part 1, p 3-22, December 1973. 12 fig, 2 tab, 21 ref.

Descriptors: *Sea ice, *Ice cover, *Cryology, Deformation, Topography, Strain, Stress, Movement, Winds, Currents(Water), Plastic deformation, Aerial photography.
Identifiers: *Pack ice, *Beaufort Sea, Ice dynamics.

The deformation of a strain triangle approximately 6 x 8 x 11 km located on first-year ice in the Beaufort Sea was observed over a 2-week period in March 1971. Significant strain events were observed during short (6-hour) time periods. The long-term (one day or more) divergence rate varied between 0.04 and 0.00008 per hour. Short-term divergence rates showed values as high as 0.00029 per hour. The floes to the east were moving south relative to the floes to the west. This agrees with the shear pattern that might be expected, considering the location of the station in the Pacific Gyre. Studies of fracture (lead and crack) orientations in the vicinity of the strain triangle indicate reasonable correlations with the orientation of the strain rate ellipse. A qualitative relation is suggested between the fracture density and the long-term divergence rate. Correlations were also observed between the divergence of the wind field as computer from the surface pressure field and the ice divergence. (See also W74-06716) (Knapp-USGS)
W74-06717

STRUCTURE OF A MULTIYEAR PRESSURE RIDGE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
A. Kovacs, W. F. Weeks, S. Ackley, and W. D. Hibler, III.
In: Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971: Army Cold Regions Research and Engineering Laboratory Research Report 315, Part 2, p 23-33, December 1973. 11 fig, 12 ref.

Descriptors: *Sea ice, *Ice cover, *Cryology, Deformation, Topography, Strain, Stress, Movement, Winds, Currents(Water), Plastic deformation, Aerial photography.
Identifiers: *Pack ice, *Beaufort Sea, Ice dynamics.

Three transverse profiles were measured across a large pressure ridge located in the Beaufort Sea. The ridge sail extended 4 m above sea level and the ridge keel 13 m below. The cross sections of the ridge keel are roughly semicircular, suggesting that form drag coefficients for flow transverse to the long axes of multiyear ridges may be as high as 0.8. Much of the ice in the ridge has a very low salinity and is quite strong. All the interblock voids that initially existed in the ridge at the time of its formation have been completely filled with ice. These observations, coupled with icebreaking experience, indicate that multiyear ridges are obstacles to even the largest icebreaking ship and should be avoided if possible. A very large first-year ridge with a sail height of 12.8 m is also described. This is the largest free-floating ridge yet recorded. (See also W74-06716) (Knapp-USGS)
W74-06718

TOP AND BOTTOM ROUGHNESS OF A MULTIYEAR ICE FLOE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
W. D. Hibler, III, S. F. Ackley, W. F. Weeks, and A. Kovacs.
In: Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971: Army Cold Regions Research and Engineering Laboratory Research Report 315, Part 3, p 35-44, December 1973. 8 fig, 1 tab, 9 ref.

Descriptors: *Sea ice, *Ice cover, *Cryology, Deformation, Topography, Strain, Stress, Movement, Winds, Currents(Water), Plastic deformation, Aerial photography.
Identifiers: *Pack ice, *Beaufort Sea, Ice dynamics.

A spectral study of the snow and ice topography on a multiyear ice floe shows that the snow cover, although attenuating the roughness amplitude of the ice surface, does not cover it completely. In general the snow surface variance is lower by a factor of one-third to one-fourth than the ice surface variance. The correlation between snow and ice surface roughness is highly significant for long wavelengths (> 8 m), but fails to be significant for short wavelengths (< 4 m). Although the ice sheet as a whole is in free-floating, isostatic equilibrium, pronounced local deviations from isostatic equilibrium are common. The trend is for ice drafts to deviate more than expected from isostasy for thin ice and less than expected for thick ice. Estimates are also made of the number of ice thickness measurements required to obtain the mean thickness of the multiyear floe to any specified accuracy. (See also W74-06716) (Knapp-USGS)
W74-06719

AIRPHOTO ANALYSIS OF ICE DEFORMATION IN THE BEAUFORT SEA,
A. D. Hartwell.
In: Investigations Performed on the Arctic Sea Ice Dynamics Joint Experiment, March 1971: Army Cold Regions Research and Engineering Laboratory Research Report 315, Part 4, p 45-60, December 1973. 18 fig, 1 tab, 6 ref.

Descriptors: *Sea ice, *Ice cover, *Cryology, Deformation, Topography, Strain, Stress, Movement, Winds, Currents(Water), Plastic deformation, Aerial photography.
Identifiers: *Pack ice, *Beaufort Sea, Ice dynamics.

Ice deformation in a 175 sq km area of the Beaufort Sea was analyzed by means of sequential aerial photographs. The approximate time, direction and magnitude of deformational motion were determined by combining observations of the changes in features related to ice deformation, such as leads, fractures and pressure ridges, and mesoscale measurements of strains and strain rates on the ice. During this period a series of compressions, extensions and shearing motions occurred, producing numerous changes in ice morphology. The entire area was apparently under considerable lateral constraint with no observable rotation or rounding of floes. No leads wider than about 150 m were present. Shearing motion along one individual lead of up to 280 m was documented by the photographs. Relative motion along shear zones was nearly always dextral or right lateral in accord with the clockwise rotation of the Pacific Gyre. (See also W74-06716) (Knapp-USGS)
W74-06720

DATA ON MORPHOLOGICAL AND PHYSICAL CHARACTERISTICS OF SEA ICE IN THE BEAUFORT SEA,
Cold Regions Research and Engineering Lab., Hanover N. H.
S. F. Ackley, A. Kovacs, W. F. Weeks, and W. D. Hibler, III.
In: Investigations Performed on the Arctic Ice Dynamics Joint Experiment, March 1971: Army Cold Regions Research and Engineering Laboratory Research Report 315, Part 5, p 61-63, December 1973. 3 fig, 3 tab.

Descriptors: *Sea ice, *Ice cover, *Cryology, Deformation, Topography, Strain, Stress, Movement, Winds, Currents(Water), Plastic deformation, Aerial photography.
Identifiers: *Pack ice, *Beaufort Sea, Ice dynamics.

Two measurements were made of block sizes in newly formed pressure ridges in ice of the Beaufort Sea. Block size measurements assist in the calculation of the fracture energy necessary to build pressure ridges. Two vertical profiles were also obtained, as well as some near-surface salinities in thick first-year ice and in newly formed ice measured in concurrence with ground-based microwave ellipsometer studies. (See also W74-06716) (Knapp-USGS)
W74-06721

AN EXPANDING ROLE FOR SUBARCTIC WATERSHED RESEARCH,
Cold Regions Research and Engineering Lab., Fairbanks, Alaska.
For primary bibliographic entry see Field 4D.
W74-06884

CHEMICAL PROFILE OF THE ROSS ICE SHELF AT LITTLE AMERICA V, ANTARCTICA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
C. C. Langway, Jr., M. Herron, and J. H. Cragin.
Research Report 316, January 1974. 5 p, 1 fig, 1 tab, 17 ref. NSF AG-212, AG-394.

Descriptors: *Glaciers, *Cations, *Provenance, *Antarctic, Sodium, Potassium, Magnesium, Calcium, Movement, Glaciation, Geochemistry, Ions, Water chemistry.
Identifiers: *Ross Ice Shelf(Antarctica).

Measurements of the concentrations of Na, K, Mg, and Ca were made on 28 samples from the 255-m-deep ice core from Little America V, Antarctica. All concentrations decrease sharply with depth from the firn-ice transition at 52 m to somewhere between 125 m and 150 m. From 150 m to 250 m the cationic concentrations are relatively constant. This shows that the ice above 125 m fell as snow on the Ross Ice Shelf and that ice below 150 m originated inland on Marie Byrd Land. (Knapp-USGS)
W74-06921

FOLDING OF COLD ICE,
Ohio State Univ. Research Foundation, Columbus. Inst. of Polar Studies.
M. J. McSaveney.
Antarctic Journal, Vol 8, No 6, p 344-346, November-December 1973. 2 fig, 3 ref. NSF Grant GV-28804.

Descriptors: *Glaciers, *Glaciology, *Antarctic, *Folds(Geologic), Plasticity, Ice, Rheology, Strain, Movement.

Many glaciers in southern Victoria Land, Antarctica, have conspicuous trains of undulations, known as wave ogives, on their surfaces. Perhaps the most extreme example is Bartley Glacier in Wright Valley. Deformation of ice in ogives on Meserve Glacier is an ongoing process. Folding occurs in cold ice and need not relate to a warmer time. Folding and ogive formation are related to the internal stress regime and viscous properties of glacier ice. In glaciers with appreciable concentrations of sand, viscous properties of the ice and sand layers may strongly influence the nonhomogeneous strain observed as folds. (Knapp-USGS)
W74-06928

ANALYSIS OF IODINE IN ANTARCTIC SNOW,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 5B.
W74-06929

SILVER CONCENTRATIONS IN ANTARCTIC SNOW AND FIRN,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 5A.
W74-06930

ANALYSIS OF THE CONCENTRATION OF MICROPARTICLES IN THE LONG ICE CORE FROM BYRD STATION,
Ohio State Univ., Research Foundation, Columbus. Inst. of Polar Studies.
L. G. Thompson, W. L. Hamilton, and C. Bull.
Antarctic Journal, Vol 8, No 6, p 340-341, November-December 1973. 2 fig, 8 ref. NSF Grant GV-32899.

Descriptors: *Dusts, *Antarctic, *Ice, *Climatology, *Oxygen isotopes, Stratigraphy, Glaciology.

During 1973 measurements were made of the concentrations and size distributions of microparticles in 15 representative sections, averaging 1 meter in length, taken from the 2164-meter-long ice core from Byrd Station. The study was designed to clarify relationships between microparticle concentrations and climate, by comparing the concentrations and size distributions with 0-18 values of ice from the same depths. Relationships were established over seasonal, decennial, and millenial time intervals. The total concentration of microparticles (defined as the number of particles greater than 0.65 micron diameter in a 500 microliter sample of meltwater) is greatest in the samples with the largest negative 0-18 values. If annual positive balance remained constant, the vertical strain rate calculated from the thinning of annual layers is -0.000028 per yr. (Knapp-USGS)
W74-06931

PB-210 CONCENTRATION IN ICE MEASURED AT SOUTH POLE STATION,
Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Centre des Faibles Radioactivities.
For primary bibliographic entry see Field 5A.
W74-06932

2D. Evaporation and Transpiration

EVAPORATION SUPPRESSION, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 3D.
W74-06501

EVAPORATION FROM BRINE STORAGE RESERVOIRS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
F. R. Crow.
Available from the National Technical Information Service as PB-231 187; $3.25 in paper copy, $1.45 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Final Technical Completion Report, March 1, 1974. 46 p, 15 fig, 10 tab, 8 ref. OWRR A-029-OKLA (1). 14-31-0001-4036.

Descriptors: *Evaporation, *Reservoir storage, Seepage, Chemical analysis, Sodium chlorides, Electrical conductance, Temperature, Saline water, Great Plains, *Oklahoma, Brines, *Salinity, Dissolved solids, Salts.
Identifiers: *Brine storage reservoirs, Arkansas River, Red River, *Brine evaporation.

The broad objective was to determine the relationships between saline concentration and the rate of evaporation of brine solutions. Relationships thus established would be applicable to evaporation design problems in brine storage reservoirs that have been proposed for abatement of natural and man-made salt pollution of major portions of the waters of Arkansas and Red Rivers whereby the effluent from highly concentrated brine springs, marshes and salt flats would be stored and ultimately evaporated, if possible. The experiments were conducted in four sunken evaporimeters, 6.5 ft. diameter by 2 ft deep, insulated at the sides and bottom with 12 in. of urethane foam. Liners were used to prevent corrosion and seepage. The original custom installed liners of fiber glass and epoxy resin were unsatisfactory. Two thicknesses of 6 mil. black polyethylene sheet plastic formed a satisfactory liner. Frequent seepage tests were made to detect leaks. Brine evaporation tests were conducted from August 2, 1972 until August 30, 1973. Brines were constituted to desired strength by mixing tap water with granular salt from a commercial salt works near Erick, Oklahoma, one of the major sources of natural brine pollution on the Red River. Four long duration tests in the summer and fall months of 1972 and '73 showed evaporation was inversely proportional to amount of total dissolved solids. Compared with fresh water, evaporation from a brine solution with an average 234,000 ppm total dissolved solids was 19.2% less than from fresh water.
W74-06517

STUDIES OF THE FOREST ENERGY BUDGET,
Oregon State Univ., Corvallis. Dept. of Forest Engineering.
L. W. Gay, and H. R. Holbo.
Available from the National Technical Information Service as PB-231 221; $3.25 in paper copy, $1.45 in microfiche. Oregon Water Resources Research Institute, Corvallis, Project Completion Report, March 1974. 34 p, 7 fig, 2 tab, 73 ref. OWRR A-010-ORE (7).

Descriptors: *Energy budget, Evapotranspiration, *Forest management, Energy conversion, *Canopy, *Washington, Model studies, Reviews, *Douglas fir trees.
Identifiers: *Cedar River(Wash), Forest energy analysis, Bowen ratio model.

Application of the mean-profile energy budget analysis to forests is discussed, with regard to limitations imposed by the forest environment.

These limitations are primarily associated with the diffuse structure and aerodynamically rough nature of forest canopies, which contrast with the dense and relatively smooth canopies of agricultural crops. Results of the few forest energy budgets that have been completed are reviewed by country of origin and number of articles. The results from these studies are compared with a clear weather energy budget for a second-growth Douglas-fir site on the Cedar River, Seattle, Washington. Despite obvious limitations upon interpretation of variability from the two estimates made, this appears to be the first forest study to replicate the energy budget measurements. The variability found here confirms the necessity for replication in future experiments. Literature review confirmed that among mean-profile methods, the Bowen ratio was the most widely used model for forest energy budget analysis. Results are based on the Bowen ratio model.
W74-06518

UPWARD FLOW FROM SHALLOW WATER TABLES,
Colorado State Univ., Fort Collins.
For primary bibliographic entry see Field 2F.
W74-06844

FIELD MEASUREMENT OF EVAPORATION FROM SOIL SHRINKAGE CRACKS,
Agricultural Research Service, Temple, Tex. Blackland Conservation Research Center.
J. T. Ritchie, and J. E. Adams.
Soil Science Society of America Proceedings, Vol 38, No 1, p 131-134, January-February 1974. 3 fig, 2 tab, 9 ref.

Descriptors: *Evaporation, *Soil water, *Soil moisture, *Cracks, Lysimeters, Expansive soils, Unsaturated flow, Soil water movement.
Identifiers: Shrinkage cracks.

Evaporative fluxes from a natural shrinkage crack and from an artifically induced soil shrinkage crack were measured. Evaporation from the soil surface, except at the crack opening, was prevented by covering the lysimeter with plastic film. Evaporation rates from the natural and induced crack averaged about 0.6 mm/day. The horizontal soil water flux in the liquid phase to the crack wall was quite low, indicating that most of the measured evaporation resulted from vapor transport from some distance in the soil pores to the crack walls. Diurnal variations in evaporation rates were closely related to diurnal changes in vapor pressure deficit of the atmosphere above the soil surface. Evaporation rates from the natural crack experiment were practically the same when the crack and soil surface were exposed to the atmosphere as when only the crack opening was exposed. Therefore, most evaporation from cracked, dry clay soil occurs because of the presence of skrinkage cracks. These results suggest a possibility for conserving water by partially filling the skrinkage cracks with dry soil or mulch to reduce evaporation. (Knapp-USGS)
W74-06900

THE EVAPORATION FROM A WATER PAN--ITS LIMITED SIGNIFICANCE (L'EVAPORATION D'UN BAC D'EAU LIBRE--SA SIGNIFICATION RESTREINTE),
Institut Royal Meteorologique de Belgique, Brussels.
F. Bultot, and G. L. Dupriez.
Journal of Hydrology, Vol 20, No 1, p 83-95, September 1973. 2 fig, 2 tab, 9 ref.

Descriptors: *Evaporation, *Evapotranspiration, *Evaporimeters, *Calibrations, *Evaporation pans, Turbulence, Instrumentation, Heat transfer, Diffusion, Solar radiation.

There is no simple relation nor even a strong correlation between daily evaporation measured by means of a water pan and potential evapotranspiration from neighboring natural surfaces. Generally evaporation from the pan is reduced due to the fact that the incident global solar radiation penetrates partially into the water and consequently a portion of the radiant energy flux is not caught by the surface. The evaporation from the pan may also be increased sometimes as a result of fast transfer of heat from underlying water layers towards the surface by turbulent diffusion. (Knapp-USGS)
W74-06908

INTERCEPTION LOSS IN THE HUMID FORESTED AREAS (WITH SPECIAL REFERENCE TO SUNGAI LUI CATCHMENT, WEST MALAYSIA),
Malaya Univ., Kuala Lumpur (Malaysia). Dept. of Geography.
L. K. Sim.
Malay Nat J. Vol 25, No 2, p 104-111, 1972. Illus.
Identifiers: Catchments, *Forested areas, Humid, *Interception loss, *Evaporation, *Malaysia(Sungai-Lui catchment).

A comparison of precipitation measurements on top of the forest canopy with those at ground level was made by installing a rain-gauge funnel above the trees and 3 check gauges under the trees. Measuring the throughfall with 3 gauges which were randomly shifted under the leaf canopy avoided a biased catch. The water lost in transit is called interception loss and in the area tested ranged from 25% to 80%. The intercepted amount of water is higher proportionately from smaller storms. Interception is a temporary phenomenon and the water is subsequently evaporated from the leaves and branches. Evaporation and interception are important components in the hydrologic cycle and together these may reduce to one half the total input of water in the forested areas studied.--Copyright 1973, Biological Abstracts, Inc.
W74-07015

PHYSICAL MICROCLIMATES OF EROSION-CONTROL STRUCTURES IN A SALT DESERT AREA,
Alberta Univ., Edmonton. Dept. of Botany.
For primary bibliographic entry see Field 2G.
W74-07029

THE ROLE OF DEW IN THE SEASONAL MOISTURE BALANCE OF A SUMMER-DRY CLIMATE,
Victoria Univ. (British Columbia). Dept. of Geography.
For primary bibliographic entry see Field 2B.
W74-07037

2E. Streamflow and Runoff

CHANGES IN WATER YIELD OF SMALL WATERSHEDS BY AGRICULTURAL PRACTICES,
Agricultural Research Service, Riesel, Tex.
C. W. Richardson.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 3, p 591-593, May-June, 1972. 7 fig, 5 ref.

Descriptors: Hydrology, *Flow, Precipitation(Atmospheric), Reservoir yield, *Runoff, Surface waters, Watersheds(Basins), *Small watersheds.

Agricultural practices can have a significant effect on on-site runoff from small watersheds. A simple statement that improved agricultural practices alter by a given percentage the runoff that would have occurred if the practices were not in effect is insufficient for water yield design purposes. The effect of conservation practices on water yield is highly dependent on the management level that is associated with the structural measures. Poor management practices on terraced areas may actually result in increases in water yield. The effect of conservation practices diminishes as watershed size becomes larger. On areas larger than about 300 acres, little effect of conservation practices has been noted. (Skogerboe-Colorado State)
W74-06597

OCEANOGRAPHIC FEATURES IN THE LEE OF THE WINDWARD AND LEEWARD ISLANDS: ERTS AND SHIP DATA,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
K. J. Hanson, F. Hebard, and R. Cram.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1357-1363, 1973. 9 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Oceanography, *Atlantic Ocean, Waves(Water), Turbidity, Plankton, Data collections, Pollutant identification.
Identifiers: *ERTS, Windward Islands, Leeward Islands.

Analysis of the ERTS data in portions of the eastern Caribbean is presented for October 1972 showing features which are, as yet, not explained. The sea state and/or swell is modified in a wind shadow of the island; the runoff of island rainfall carries high turbidity water in the mixed layer downstream of the island; or the phytoplankton in the mixed layer of the ocean has increased due to increased nutrients associated with upwelling. Ground truth data obtained in that area during November 1972 are presented. These include vertical temperature structure in the mixed layer and thermocline, and surface measurements of salinity, temperature, and chlorophyll. (See also W74-06619) (Knapp-USGS)
W74-06674

WATER DEPTH ESTIMATION WITH ERTS-1 IMAGERY,
International Imaging Systems, Mountain View, Calif.
For primary bibliographic entry see Field 2L.
W74-06680

CALCULATIONS OF WATER DEPTH FROM ERTS-MSS DATA,
Environmental Research Inst. of Michigan, Ann Arbor.
F. C. Polcyn, and D. R. Lyzenga.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1433-1441, 1973. 3 fig, 4 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Oceanography, *Bathymetry, *Depth, Data collections, Mapping, Surveys, Sounding, Topography.
Identifiers: *ERTS, *Little Bahama Bank.

ERTS-1 MSS data taken on October 10, 1972 of the Little Bahama Bank are being used to demonstrate the use of ERTS-1 data for mapping of shallow water features for the purpose of upgrading world navigation charts. Marked reflectance differences occur for the shallow water areas in bands 4, 5, and 6. Digital processing of two adjacent data tapes within the ERTS frame covering an area of about 40 by 40 miles is complete. Correlation of depth measurements to 5 meters was successful. A mathematical model for depth measurements using ratio of voltages in band 4 and 5 was successfully developed and is being tested for

accuracy. Satellite data can provide geographical evidence for verifying existence or nonexistence of doubtful shoal waters now appearing on world charts and considered to be hazardous to shipping. (See also W74-06619) (Knapp-USGS)
W74-06681

LABORATORY EXPERIMENTS WITH SURFACE RUNOFF,
Alberta Dept. of Environment, Edmonton. Div. of Technical Services.
I. Muzik.
Journal of the Hydraulics Division, American Society of Civil Engineers Vol 100, No HY4, Paper 10463, p 501-516, April 1974. 12 fig, 1 tab, 22 ref, append.

Descriptors: *Overland flow, *Rainfall-runoff relationships, *Hydraulic models, *Mathematical models, Surface runoff, Unit hydrographs, Equations, Rainfall intensity.
Identifiers: *Kinematic waves.

Kinematic wave and instantaneous unit hydrograph concepts were used to predict the overland flow of hydraulic models. Laboratory conditions satisfied idealized assumptions of the tested mathematical models: that the hydrographs correspond to direct runoff resulting from rainfall distributed uniformly in time and space over a runoff plane with a constant slope. Time to peak, peak value, and total time base of the instantaneous unit hydrograph are dependent on the rainfall intensity. Predicting runoff by means of a convolution integral leads to erroneous results. Satisfactory results are obtained by analytical solution of the kinematic wave formulation of overland flow equations. Time to equilibrium predicted by the kinematic wave model as a function of rainfall intensity is in good correlation with empirically determined apparent time to equilibrium. Nonlinearity of the rainfall-runoff relationship is not affected by the slope or roughness of the runoff surface. (Knapp-USGS)
W74-06737

NUMERICAL MODEL OF ST. LAWRENCE RIVER ESTUARY,
Institute of Coastal Oceanography and Tides, Birkenhead (England).
For primary bibliographic entry see Field 2L.
W74-06738

DEVELOPING REGION IN SELF-AERATED FLOWS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik, Staunanlagen und Wasserversorgung.
For primary bibliographic entry see Field 8B.
W74-06739

DETERMINATION OF THE CONFIDENCE INTERVALS OF THE PEARSON III LAW USING ORDER STATISTICS (DETERMINATION DES INTERVALLES DE CONFIANCE DE LA LOI PEARSON III PAR LES STATISTIQUES D'ORDRE),
National Inst. of Scientific Research, Quebec.
B. Bobee, and G. Morin.
Journal of Hydrology, Vol 20, No 2, p 137-153, October 1973. 8 fig, 1 tab, 6 ref.

Descriptors: *Probability, *Statistical methods, Forecasting, Time series analysis, Streamflow forecasting, Flood forecasting, Distribution.
Identifiers: *Pearson law.

The distribution functions of the order statistics for the Pearson III law and its derived forms were used to determine the confidence intervals associated with this law. Tables and graphs show the confidence intervals and derived forms of the Pearson law. (Knapp-USGS)
W74-06906

ON FLOOD PROBABILITIES OF EAST ALPINE RIVERS,
Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
K. Cehak.
Journal of Hydrology, Vol 20, No 1, p 65-82, September 1973. 12 fig, 4 tab, 19 ref.

Descriptors: *Flood frequency, *Alpine, *Probability, Europe, Statistics, Statistical methods, Flood data, Flood recurrence interval, Flood forecasting, Variability.
Identifiers: Flood probability, *Alps.

The flood data of five stations in the East Alps with relatively long observation series were represented by means of Fisher-Tippett II or III distributions. The observations of the longest observation periods were fitted well by the type II curves. A comparison of calculations with only a part of the observations shows that the magnitude of the curvature parameter k of the Fisher-Tippett curves increases with increasing observation period. The series at hand are not long enough to see if there is a convergence to a limiting value of k. A trend test shows an increasing trend in all of the Danube stations after about 1860 and nearly no trend at all in the observations from the southern rivers. The variance spectra show that the series may be considered as realizations of autoregressive processes of the first order. Superposed to the red-noise spectra there are waves with periods of 2.35 and 8 years in the case of the Danube stations and 5.7 and 6.7 years in the case of the southern rivers. (Knapp-USGS)
W74-06909

ON SQUIRE'S THEOREM IN THE STUDY OF HYDRODYNAMIC STABILITY OF PLANE-PARALLEL FLOWS OF INCOMPRESSIBLE FLUIDS ABOUT DEFORMING BOUNDARIES,
For primary bibliographic entry see Field 8B.
W74-06911

EIGHT YEARS OF OBSERVATIONS ON THE WATER LEVEL AT QUEBEC AND GRONDINES 1962-1969: PART I--ANALYSIS OF THE TIDAL SIGNAL,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
G. Godin.
Manuscript Report Series, No 31, 1973. 145 p, 17 fig, 17 tab, 13 ref, append.

Descriptors: *Tides, *Surges, *Water level fluctuations, *St. Lawrence River, Bores, Ice jams, *Canada, Storm surge, Stage-discharge relations.
Identifiers: Quebec, Grondines.

Water levels for Quebec and Grondines are recorded hourly on punched cards since 1962. Saltwater does not reach the stations at Quebec and Grondines although they are both strongly affected by the tide which travels from the Gulf of St. Lawrence and the Atlantic and makes itself felt as far as Montreal. The mean tidal range at Quebec is over 13 feet while at Grondines it exceeds 6 feet. Fluctuations in river discharge affect the level at Grondines markedly while at Quebec, the larger capacity of the river bed diminishes their importance. Besides these sources of variability (tide and discharge), there occur sudden and dramatic changes in level which are obviously related to the atmospheric disturbances, especially cold fronts. Ice jams and ice accumulations upstream cause water level fluctuations during the winter season. (Knapp-USGS)
W74-06926

FLOOD OF OCTOBER 1972 AT PETERSBURG AND COLONIAL HEIGHTS, VIRGINIA,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 7C.
W74-06957

STREAM TEMPERATURES IN WASHINGTON STATE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-06962

2F. Groundwater

CAPILLARY PROPERTIES OF SOILS - INFLUENCE UPON SPECIFIC YIELD,
Agricultural Research Service, Fort Collins, Colo.
H. R. Duke.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 4, p 688-691, July-August, 1972. 6 fig, 2 tab, 9 ref.

Descriptors: *Specific yield, *Capillary action, Subsurface drainage, *Groundwater movement, Groundwater availability, Retention, Safe yield, Dug wells, *Porous media, Soil properties.

Capillary properties of a porous medium are important hydrologic parameters for situations of groundwater flow in which capillary effects are generally considered negligible. Although the utility of the specific yield concept has been proved many times under practical field conditions, the hydrologist should be aware of the limitations of the data he has collected. Of particular importance is an awareness of the errors introduced by using specific yields determined under one set of experimental conditions to predict ground water movement under completely different conditions. The primary purpose has been to show that specific yield as classically defined is not a unique property of the porous medium in which it is measured. (Skogerboe-Colorado State)
W74-06584

UNSTEADY RADIAL FLOW IN PARTIALLY SATURATED SOILS,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-06587

A PHYSICAL MODEL FOR PREDICTION AND CONTROL OF SALTWATER INTRUSION IN THE FLORIDAN AQUIFER,
Florida Univ., Gainesville. Dept. of Civil and Coastal Engineering.
B. A. Christensen, and A. J. Evans, Jr.
Available from the National Technical Information Service as PB-231 377, $4.00 in paper copy, $1.45 in microfiche. Florida Water Resources Research Center, Gainesville, Publication No. 27, Jan. 29, 1974. 88 p, 51 fig, 4 tab. OWRR A-022-FLA(1). 14-31-0001-3809.

Descriptors: *Florida, *Saline water intrusion, Water demand, Aquifers, Wells, Recharge, *Forecasting, *Model studies, Groundwater, Aquifer characteristics, *Artificial recharge, Pumping, *Drawdown.
Identifiers: *Hele-Shaw model.

Continuing development of the coastline zone in the middle Gulf area of Florida is increasing the demand for ground water supplies, and in turn increasing the probability of salt-water intrusion. Methods must be developed to make long-range predictions on the effects of increased demands on the Floridan aquifer. A Hele-Shaw model is a physical model which fits the requirements for long-range planning. It is well suited to handling anisotropic aquifers, difficult boundary conditions and can simulate years of field conditions in minutes of model time. The section selected for study lies in a line from the Gulf coast near Tarpon Springs to a point near Dade City and passes through the Eldridge-Wilde well field. The Eldridge-Wilde well field is the major water producer for Pinellas County. This region has experienced several years of dry weather, and pump-

ing has lowered the water levels in the aquifer by a significant amount. This loss of fresh-water head is certain to induce salt-water intrusion. A Hele-Shaw model has been built for this section, and all pertinent geological and hydrological features of the area are included. Steady-state characteristics of the aquifer system have been considered. In particular, the long-term effects due to pumping and artificial recharge were examined. (Morgan-Florida)
W74-06609

HYDROLOGIC DATA FROM THE PICEANCE BASIN, COLORADO.
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W74-06714

GROUND-WATER RECHARGE STRIP BASIN-EXPERIMENTS,
California State Univ., Fullerton. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W74-06740

UPWARD FLOW FROM SHALLOW WATER TABLES,
Colorado State Univ., Fort Collins.
P. Hamaker.
Available from the National Technical Information Service as PB-231 480 $12.25 in paper copy, $1.45 in microfiche. Ph D Thesis, September 1972. 169 p, 30 fig, 15 tab, 22 ref, append. OWRR B-013-COLO(3).

Descriptors: *Soil water movement, *Groundwater movement, *Evaporation, Water table, Drying, Water levels, Equations.

Upward flow from shallow water tables was studied by application of the flow theory; this leads to a differential equation which describes the interrelationship between the soil properties, the water table depth, the pressure head at the soil surface, and the rate of upward flow. The solution to the equation predicts that for a given soil and water table depth, the upward flux should increase and approach a finite limit as the pressure head at the soil surface becomes more negative. In one series of experiments, upward flow was induced by suction from the soil surface. For a given water table depth, the measured pressure head and hydraulic head distribution and the rate of upward flow as a function of the pressure head at the soil surface were in agreement with flow theory. The upward flux approached a limiting value as the pressure head at the soil surface became sufficiently negative. Moreover, close agreement was obtained between the theoretically predicted and experimentally observed magnitudes of the limiting fluxes. In a second series of experiments, upward flow was induced by evaporative removal of the liquid from the soil surface. The observed behavior of the upward flux was not predicted by theory. A maximum rather than a limiting flux was obtained in most cases as the soil surface dried. The experimental observations could be explained by assuming that the water content-pressure head relationship of the soil during drying was not single valued. (Knapp-USGS)
W74-06844

GROUND-WATER HYDROLOGY OF NORTHERN NAPA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
R. E. Faye.
Water-Resources Investigations 13-73, November 1973. 64 p, 19 fig, 5 tab, 36 ref.

Descriptors: *Hydrogeology, *Groundwater resources, *Aquifer characteristics, *Water quality, *California, Basic data collections, Water wells, Water yield, Groundwater movement, Hydrology, Groundwater recharge, Water utilization, Forecasting, Model studies, Water analysis, Chemical analysis, Transmissivity.
Identifiers: *Napa Valley(Calif).

The alluvium of northern Napa Valley, California, is the principal aquifer of the area and is capable of yielding as much as 3,000 gallons per minute to wells. Recharge is chiefly by percolation from streams and infiltration of precipitation. Discharge is chiefly flow to the Napa River, evapotranspiration, and pumpage from wells. About 190,000 acre-feet of water is presently (1972) stored in the alluvium of northern Napa Valley. Future annual water use in the project area will probably vary between 12,000 and 35,000 acre-feet and, for most purposes, can be supplied by the alluvial aquifer even during extended periods of limited rainfall. Low transmissivities in the alluvium, however, limit the opportunity for obtaining sustained, large yields from wells in much of the valley. Sustained drought conditions in the Napa Valley accompanied by expected increases in the use of groundwater will probably cause significant reductions in the base flow of the Napa River and cause many shallow wells in the area to dry up. Sodium chloride groundwater occurs near Calistoga and in the vicinity of Oakville and in some places is not suitable for irrigation. Model studies indicate that limited migration of sodium chloride water into intensively pumped parts of the aquifer probably will not be a serious problem. (Woodard-USGS)
W74-06880

THE PROBLEM OF DIRECT GROUNDWATER DISCHARGE TO THE SEAS,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
I. S. Zektzer, V. A. Ivanov, and A. V. Meskheteli.
Journal of Hydrology, Vol 20, No 1, p 1-36, September 1973. 2 fig, 2 tab, 126 ref.

Descriptors: *Springs, *Groundwater, *Discharge(Water), *Reviews, *Submarine springs, Oceans, Oceanography, Bottom sediments, Water chemistry, Water balance, Tracers, Geochemistry, Hydrogeology.

Studies of groundwater discharge to the seas and oceans are reviewed. They include studies of the role of submarine groundwater discharge in the world water balance, the effect of groundwater on forming the water and salt balances of the seas, the interrelationship between sea and groundwaters in coastal areas, the effect of groundwater discharge on forming mineral deposits at sea and ocean floors, and points of fresh groundwater discharge on the sea floor for water-supply purposes. The methods of investigating groundwater outflow to the seas and oceans are divided into two large groups: those based on studying coastal drainage areas and those based on studying the sea. The coastal techniques are subdivided into the hydrodynamic method, the average long-term water-balance method, the combined hydrological and hydrogeological method, and the analog-simulation method. The sea techniques include those based on studying seawater and those based on studying the sea bottom. The seawater methods incorporate investigations of the electric conductivity, the distribution of temperature, the anomalies of salt composition of seawater and groundwater discharge studies with tracers. The sea-bottom methods include locating groundwater discharge from data on physical or chemical anomalies in bottom sediments/geothermal and geochemical techniques) and investigating structural features of the sea bottom (geophysical method, geomorphological method and observations by divers and submersibles). Experience in studying submarine springs and groundwater discharge to the Baltic and Caspian Seas is discussed. (Knapp-USGS)
W74-06881

A DISCRETE SPACE CONTINUOUS TIME MODELING APPROACH TO NONSTEADY FLOW IN A LEAKY AQUIFER SYSTEM OF FINITE CONFIGURATION,
California Univ., Davis.
M. A. Marino, and W. W-G. Yeh.
Journal of Hydrology, Vol 20, No 3, p 255-266, November 1973. 5 fig, 11 ref.

Descriptors: *Mathematical models, *Artesian aquifers, Drawdown, Groundwater movement, Equations, Finite element analysis.
Identifiers: Leaky artesian aquifers.

A technique is presented that treats a leaky confined aquifer system of finite configuration. By means of a discrete space continuous time modeling approach, the partial differential equation governing the flow system is transformed into a set of ordinary differential equations that can be easily integrated numerically on a high speed digital computer using available subroutines. The finite difference formulation is in effect an explicit scheme. A criterion is developed for which the scheme is computationally stable. A numerical example is presented. (Knapp-USGS)
W74-06887

ON THE LEAKAGE ASSUMPTION APPLIED TO EQUATIONS OF GROUNDWATER FLOW,
Birmingham Univ. (England). Dept. of Civil Engineering.
T. D. Streltsova.
Journal of Hydrology, Vol 20, No 3, p 237-253, November 1973. 3 fig, 24 ref.

Descriptors: *Artesian aquifers, *Groundwater movement, Water table, Equations, *Seepage, Percolation, Water yield, Recharge.
Identifiers: *Leaky artesian aquifers.

The behavior and the delayed response of flow to a well in an unconfined aquifer was studied with consideration of the variable vertical movement of flow inherent in unconfined flow. The effect of elastic storage was also taken into account. The typical S-shaped form of the characteristic time-drawdown curve of an unconfined aquifer was analyzed. The vertical components of flow are a significant factor in the delayed response of an unconfined aquifer while the contribution of the unsaturated zone is essentially subordinate. An equation including allowance for the drainage from the unsaturated zone was derived. (Knapp-USGS)
W74-06888

GROUNDWATER TRACING WITH POST SAMPLING ACTIVATION ANALYSIS,
Pennsylvania State Univ., University Park.
J. K. Schmotzer, W. A. Jester, and R. R. Parizek.
Journal of Hydrology, Vol 20, No 3, p 217-236, November 1973. 10 fig, 1 tab, 20 ref.

Descriptors: *Tracers, *Bromine, Neutron activation analysis, Karst hydrology, Groundwater movement, Sampling, Tracking techniques.

A tracing technique uses low concentrations of a nonradioactive tracer, the bromide ion. Concentrations may be so low that they do not constitute a health or pollution problem. The tracer is detected by activation analysis. No chemical separation techniques are required. The technique is safe, and tracers can be detected as low as 20 parts per billion over background concentrations. The bromide ion does not appear to be lost by precipitation, absorption or adsorption and is biologically stable. The technique was tried on sinkhole, conduit and spring systems in a carbonate terrain, in central Pennsylvania. Ammonium bromide was added in a conduit 500 ft. from its discharge point. Tracer first appeared at the discharge point 1 h after injection (0.11 ppm vs/an average background of 0.03 ppm). The maximum passed at 1 h 30 min and the spread of the spike was estimated to be over 5 h. For a peak maximum of 0.1 ppm, only 3 g of ammonium bromide would have been required. The inlet concentration would have been only 2.8 ppm,

indicating the sensitivity of the method. (Knapp-USGS)
W74-06889

ON THE SOLUTION OF TRANSIENT FREE-SURFACE FLOW PROBLEMS IN POROUS MEDIA BY THE FINITE ELEMENT METHOD,
State Univ. of New York, Buffalo. Faculty of Engineering and Applied Sciences.
R. T-S. Cheng, and C-Y. Li.
Journal of Hydrology, Vol 20, No 1, p 49-63, September 1973. 9 fig, 15 ref. NSF Grant GK-11687.

Descriptors: *Groundwater movement, *Water table, *Finite element analysis, *Numerical analysis, Drawdown, Unsteady flow, Seepage, Dams, Drainage, Porous media.
Identifiers: Free-surface flow.

A numerical procedure is presented to deal with solution of transient free-surface flows in porous media. The governing boundary-value problem for the piezometric potential is solved by the finite element method. The initial-value problem which describes the transient motion of the free-surface is solved by the method of quasi-lineraization. The numerical scheme was applied to isotropic and anisotropic earth dam problems and also to a ditch drainage problem. Excellent agreements were obtained compared with known solutions. This computational procedure is stable and suitable for this class of problems. (Knapp-USGS)
W74-06890

CONSERVATION EQUATIONS FOR NONISOTHERMAL FLOW IN POROUS MEDIA,
Case Western Reserve Univ. Cleveland, Ohio. Div. of Fluid, Thermal and Aerospace Sciences.
A. Dybbs, and S. Schweitzer.
Journal of Hydrology, Vol 20, No 2, p 171-180, October 1973. 23 ref.

Descriptors: *Porous media, *Groundwater movement, *Mass transfer, *Heat flow, Heat transfer, Darcys law, Energy transfer, Equations, Leaching, Sorption.
Identifiers: Nonisothermal flow.

Mass, momentum and energy equations that can be applied to nonisothermal flow in porous media are derived by taking a suitable volume average of the microscopic equations. The resulting macroscopic equations are then appropriate for experimental comparison. These equations can be related to measurable physical quantities of porous media. The energy equation contains a term which may be considered as an 'effective thermal conductivity' due to convection. In most cases this term must be considered and evaluated experimentally. (Knapp-USGS)
W74-06892

A COMPARISON OF HYDRAULIC CONDUCTIVITIES CALCULATED WITH MORPHOMETRIC AND PHYSICAL METHODS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W74-06899

KARST HYDROLOGY--A REVIEW,
Geological Survey, Raleigh, N.C.
H. E. LeGrand, and V. T. Stringfield.
Journal of Hydrology, Vol 20, No 2, p 97-120, October 1973. 3 fig, 1 tab, 59 ref.

Descriptors: *Karst hydrology, *Karst, *Hydrogeology, *Reviews, Groundwater movement, Erosion, Water chemistry, Limestones, Gypsum, Geomorphology, Solubility, Structural geology.

Interest in karst hydrology has increased greatly in the past decade; this interest has resulted in the international exchange of numerous published reports on local areas and on special topical karst problems. Many of these reports have been used in preparing this review paper, which synthesizes results of many workers and focuses attention on: (1) the development of karst features through hydrologic processes; and (2) hydrologic systems of karst terranes. Karst regions of the world are characterized by limestones and other soluble rocks at or near land surface that have been modified by solutional erosion. Such surface features as sinks, long dry valleys, sparse streams, and bare rock and such subsurface features as caverns, arterial solution openings leading to large springs, and a deep water table are typical of karst terranes. These features result in an uneven distribution of permeability in karst systems and surface and subsurface hydrologic conditions that require special hydrogeologic studies. Local high permeability at shallow depth in mature karst regions leads to an ecology associated with a soilless and water-scarce surface environment. Many practical problems result from this high permeability, including: (1) scarcity and poor predictability of groundwater supplies; (2) scarcity of surface-water supplies; (3) instability of the ground; (4) leakage of surface reservoirs; and (5) an unreliable waste-disposal environment. (Knapp-USGS)
W74-06907

ELECTRO-OSMOTIC EFFECTS IN A BENTONITE-WATER SYSTEM,
Harcourt Butler Technological Inst., Kanpur (India). Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-06910

GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS: PART II--POLLUTION FROM WELLS.
For primary bibliographic entry see Field 5B.
W74-06933

PROCEDINGS NINTH BIENNIAL CONFERENCE ON GROUND WATER.
For primary bibliographic entry see Field 5B.
W74-06942

AVAILABILITY OF GROUND WATER IN THE GRANTS PASS AREA, JOSEPHINE COUNTY, OREGON,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 7C.
W74-06959

QUALITY OF GROUND WATER IN THE LOWER COLORADO RIVER REGION, ARIZONA, NEVADA, NEW MEXICO, AND UTAH,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 7C.
W74-06960

WATER RESOURCES OF NORTHWESTERN MISSOURI,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-06961

2G. Water In Soils

A SIMPLE AUTOMATIC SOIL PERCOLATOR,
Hawaii Univ., Honolulu.
For primary bibliographic entry see Field 7B.
W74-06531

WHEAT AND GRAIN SORGHUM IRRIGATION IN A WIDE BED-FURROW SYSTEM,
Agricultural Research Service, Bushland, Tex.
For primary bibliographic entry see Field 3F.
W74-06580

A LARGE UNDISTURBED, WEIGHING LYSIMETER FOR GRASSLAND STUDIES,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
J. D. Armijo, G. A. Twitchell, R. D. Burman, and J. R. Nunn.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 5, p 827-830, September-October, 1972. 6 fig, 7 ref.

Descriptors: *Lysimeters, *Moisture meters, *Evapotranspiration, Moisture content, Runoff, Water loss, Tunneling machines, *Colorado.

A large weighing type lysimeter was installed in the high plains of northeastern Colorado. The unit consists of a steel tank 10 feet in diameter and 4 feet deep. The container is made of 1-inch thick steel plate. The unit rests on a weighing mechanism consisting of a counter balance and electronic load cells. The soil in the lysimeter is undisturbed with native vegetation. This was accomplished using the tank as a large coring tube to cut out the undisturbed core. All of the related apparatus is placed underground except for a small access manhole located 18 feet from the edge of the unit. Data collection has just begun. Total cost for the unit and installation was $51,000. (Skogerboe-Colorado State)
W74-06581

DEVELOPMENT OF ASPHALT MOISTURE BARRIER EQUIPMENT,
International Harvester Co., Hinsdale, Ill.
For primary bibliographic entry see Field 3F.
W74-06586

UNSTEADY RADIAL FLOW IN PARTIALLY SATURATED SOILS,
Idaho Univ., Moscow. Dept. of Agricultural Engineering.
D. W. Fitzsimmons.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 5, p 912-918, September-October, 1972. 9 fig, 1 tab, 13 ref.

Descriptors: *Groundwater movement, Hydrology, *Capillary conductivity, *Soil moisture, Soil water, Groundwater, Moisture tension, Permeability, Soil physics, Darceys law, Base flow, *Unsteady flow, *Saturated soils, *Mathematical models, Simulation analysis.
Identifiers: *Imbibition.

A numerical model for simulating horizontal imbibition in a radially symmetric flow system was developed. Unsteady radial flow from a cylindrical source into a partially saturated soil was studied in the laboratory and with the model to determine the effects of boundary and initial conditions on this type of flow. The model is based on the solution of the nonlinear partial differential equation for unsteady radial flow. A predictor-corrector modification of the Crank-Nicholson implicit difference method was used to solve the equation subject to the appropriate boundary and initial conditions. Imbibition was studied in the laboratory by allowing liquid to flow into a radially symmetric, soil-filled flow system at pressures which were below atmospheric. Tensiometers along the length of the flow system were used, in conjunction with a pressure transducer-indicator system, to measure the space-time distribution of capillary pressure head in the flow system. A balance was used to monitor the inflow during each test. (Skogerboe-Colorado State)
W74-06587

EVALUATION OF A FURROW MODIFYING DEVICE,
Agricultural Research Service, Auburn, Ala.
For primary bibliographic entry see Field 3F.
W74-06588

DEEP PLOWING - AN ENGINEERING APPRAISAL,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 3F.
W74-06590

A SIMULATED ENVIRONMENTAL MODEL OF TEMPERATURE, EVAPORATION, RAINFALL, AND SOIL MOISTURE,
Agricultural Research Service, State College, Miss.
For primary bibliographic entry see Field 3F.
W74-06591

HYDRODYNAMICS OF BORDER IRRIGATION ADVANCE,
Nebraska Univ., Mitchell. Scotts Bluff Experiment Station.
For primary bibliographic entry see Field 3F.
W74-06592

PERFORMANCE OF A TILE DRAINAGE SYSTEM: AN EVALUATION OF A TILE DESIGN AND MANAGEMENT,
Agricultural Research Service, Urbana, Ill.
For primary bibliographic entry see Field 3F.
W74-06596

DEEP PLOWING AND CHEMICAL AMENDMENT EFFECT ON A SODIC CLAYPAN SOIL,
Agricultural Research Service, Mandan, N. Dak.
For primary bibliographic entry see Field 3F.
W74-06598

APPLICATION OF MONTE CARLO METHOD TO SOIL WATER MOVEMENT,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
S-F. Shih, and G. J. Kriz.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 5, p 897-901, September-October, 1972. 5 fig, 4 tab, 8 ref.

Descriptors: *Soil water movement, *Soil physics, *Drainage, Porosity, Permeability, Percolation, Darcey's law, Soil water, Soil moisture, *Monte Carlo method.

An approach for determining approximate solutions to problems of water movement in soils called the Monte Carlo method was presented and demonstrated. The basic concepts of the method are probability distribution, random number generations, and sampling techniques. The method was applied to solve problems of steady state and transient flow with and without recharge. Solutions were obtained directly by Monte Carlo techniques without analytically solving the flow equation. Using the method of solution described, the hydraulic head or potential at any isolated point in the region can be obtained without solving for the hydraulic head or potential at the other mesh points. Comparisons of results obtained using the Monte Carlo method were made with values previously obtained by others. These comparisons indicate that the method is applicable to problems of water movement in soils. (Skogerboe-Colorado State)
W74-06599

IDENTIFICATION OF SOIL ASSOCIATIONS IN WESTERN SOUTH DAKOTA ON ERTS-1 IMAGERY,
South Dakota State Univ., Brookings. Dept. of Plant Science; and South Dakota State Univ., Brookings. Remote Sensing Inst.
F. C. Weston, and V. I. Myers.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 965-972, 1973. 6 fig, 3 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Soil surveys, *Mapping, *South Dakota, Data collections, Data processing, Soil investigations.
Identifiers: *ERTS, Soil associations.

Film color composites of ERTS bands 4, 5, and 7 show the soil association of western South Dakota, and in addition several new soil association areas have been brought to light. In semiarid western South Dakota, landscape features are well defined. Steep valley sides, broad interfluves, and contrasting textures are present in this area and all are clearly visible on ERTS color composites. The 8-million-acre scene that can be scanned on one frame allows for comparisons of soil associations usually over their entire extent. This is an advantage since anomalies immediately become apparent. (See also W74-06619) (Knapp-USGS)
W74-06629

IN SITU SPECTRORADIOMETRIC QUANTIFICATION OF ERTS DATA,
Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
E. F. Yost.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1253-1258, 1973. 5 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Playas, *Soil moisture, Vegetation, Calibrations, Radiation, Albedo, Wavelengths, Data collections.
Identifiers: *ERTS, *Spectroradiometry.

A method of additive color analysis of a single multispectral band taken on different dates indicates that ERTS-1 bulk images have sufficient spatial and spectral fidelity to show indications of the presence of soil moisture in desert playas and changes in soil moisture with time. Synthesizing the narrow band imagery by projecting the two visible bands as blue and red and the near-infrared band as green shows a distinct difference between pine trees and the other two species. (See also W74-06619) (Knapp-USGS)
W74-06663

GAMMA RADIATION MEASUREMENTS OF BULK DENSITY CHANGES IN A SOIL PEDON FOLLOWING IRRIGATION,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
R. J. Reginato.
Soil Science Society of America Proceedings, Vol 38, No 1, p 24-29, January-February 1974. 3 fig, 4 tab, 14 ref.

Descriptors: *Bulk density, *Expansive soils, *Nuclear moisture meters, Gamma rays, Irrigation effects, Soil physical properties.

Bulk density in a soil pedon was measured with a gamma-ray transmission technique utilizing Cs-137 and Am-241. Both gamma-ray sources could not be used simultaneously. By alternating sources for each scan down the soil profile, bulk density was found to decrease in the top 6 cm of soil about 30 minutes after water was ponded on the soil surface. As soon as the water drained from the surface, bulk density values approached preirrigation levels. Changes in height of the soil surface upon irrigation corresponded with changes in bulk density. (Knapp-USGS)
W74-06715

GRAVITY CORRECTION DUE TO A VARIATION OF PRESSURE HEAD WITHIN A CAVITY,
Connecticut Agricultural Experiment Station, New Haven.
J-Y. Parlange.
Soil Science Society of America Proceedings, Vol 38, No 1, p 15-17, January-February 1974. 1 fig, 12 ref.

Descriptors: *Infiltration, *Soil water movement, Percolation, *Pressure head, Moisture content, Unsaturated flow, Tension.

The infiltration of water from small cavities filled with water is affected by gravity, both within and without the cavity and these two effects are of the same order. The effect within the cavity is assessed quantitatively for small spherical cavities that are entirely or partially buried in the soil. As an example, the case of a cavity entirely buried in the soil is discussed in detail. (Knapp-USGS)
W74-06734

MEASUREMENT OF HYDRAULIC CONDUCTIVITY BY MEANS OF STEADY, SPHERICALLY SYMMETRIC FLOWS,
Agricultural Research Service, Madison, Wis. Soil and Water Conservation Research Div.
C. Dirksen.
Soil Science Society of America Proceedings, Vol 38, No 1, p 3-8, January-February 1974. 5 fig, 1 tab, 20 ref.

Descriptors: *Hydraulic conductivity, *Unsaturated flow, *Tensiometers, *Soil water movement, Instrumentation, Tension, Infiltration, Percolation, Pressure head, Moisture content.

The dependence of hydraulic conductivity upon pressure head can be determined from a series of steady, spherically symmetric flows: at any point the hydraulic conductivity is equal to the rate of change of the steady flux per unit solid angle with respect to the pressure head of that point, divided by its radial distance from the center of the water source. This method is useful for in-situ measurements in the field because it requires only one controlled boundary condition, and does not require one-dimensional flow. Hydraulic conductivity values derived from the pressure head in the source cavity in field tests were the same as those derived from tensiometer measurements near the source. A range of hydraulic conductivity values can be obtained faster with a series of different, steady pressure heads in the source cavity, rather than by measurements on a series of tensiometers located at several distances from the source. Gravity tends to distort the spherical symmetry of the flow. For most soils the effect of gravity near the cavity is small enough to obtain satisfactory hydraulic conductivity values. Gravity has no effect on the pressure head distribution directly below the cavity, suggesting that this is a preferred location for tensiometers. The analytical solution obtains the hydraulic conductivity in an exact manner for any position. The radius of the cavity should be kept as small as possible. (Knapp-USGS)
W74-06735

SOLUTION OF EQUATION FOR VERTICAL UNSATURATED FLOW OF SOIL WATER,
California Univ., Santa Barbara.
J. C. Bruch, Jr., and G. Zyvoloski.
Soil Science, Vol 116, No 6, p 417-422, December 1973. 4 fig, 11 ref. OWRR A-039-CAL(6) California Project W-336.

Descriptors: *Unsaturated flow, *Soil water movement, *Infiltration, *Finite element analysis, Equations, Hysteresis, Capillary conductivity, Porous media.
Identifiers: *Galerkin method.

The nonlinear equation describing the unsteady and unsaturated, one-dimensional vertical flow in porous media may be solved by the finite element method employing a Galerkin approach. Finite elements in space and time and linear shape functions were used for two different element configurations, triangles and rectangles. A quadratic form used for the diffusion coefficients and capillary conductivities based on curve-fitting of experimental data of these functions. The results are compared on the basis of element type, as well as to solutions obtained by difference methods and a series solution technique, and are in good agreement. This method is useful in that it is easily programmed, stable, computationally fast, converges rapidly to the solution, and does not require constant parameters over the entire solution domain. (Knapp-USGS)
W74-06736

THE GENUS NEOCHLORIS STARR (CHLOROPHYCEAE, CHLOROCOCCALES),
Slippery Rock State Coll., Pa. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W74-06760

DISTRIBUTION OF MERCURY IN RESIDUAL SOILS,
Colorado School of Mines, Golden. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W74-06797

QUALITY IMPROVEMENT OF FEEDLOT LAGOON WATER BY PERCOLATION THROUGH SOIL UNDER NATIVE PASTURE,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 5D.
W74-06830

MEASUREMENTS OF THE DOWNSLOPE FLOW OF WATER IN A SOIL,
Bristol Univ. (England). Dept. of Geography.
D. R. Weyman.
Journal of Hydrology, Vol 20, No 3, p 267-288, November 1973. 9 fig, 27 ref.

Descriptors: *Soil water movement, *Saturated flow, *Unsaturated flow, *Subsurface runoff, Slopes, Topography, Percolation, Infiltration, Anisotropy, Porosity, Moisture content.

Measurements were made of unsaturated and saturated lateral soil water flow on a convex hillslope with a good soil cover and impermeable bedrock during natural rainstorms. The hydraulics of flow were examined in detail with particular reference to the role of breaks in vertical permeability, the change from saturated to unsaturated flow and the velocity of flow. A zone of soil saturation extends upwards from the slope base. Slope discharge, through the B and B/C horizons, is related to the form of the saturation zone, within which flow is lateral. The time required for vertical percolation and the low hydraulic conductivity of the lower soil horizons result in a hillslope hydrograph which is delayed and attenuated and cannot be regarded as stormflow. During drainage the saturation zone contracts and is replaced by a lateral unsaturated flow system at the profile base which supplies discharge from the B/C horizon without further recharge. In general, either distinct soil horizons or impermeable bedrock are essential for the initiation of lateral flow. Saturated flow is likely to dominate hillslope hydrographs through noncapillary pore spaces but these may be integrated to the point where Darcy's law still holds. Although lateral soil water flow is a widespread phenomenon, it is unlikely to provide storm runoff to the stream unless saturated conditions are generated within the organic horizons or flow within the lower soil horizons is dominated by non-Darcian flow through noncapillary spaces in the soil. (Knapp-USGS)
W74-06886

NITRIC OXIDE SORPTION BY CALCAREOUS SOILS: II. EFFECT OF MOISTURE ON CAPACITY, RATE, AND SORPTION PRODUCTS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.
W74-06894

KINETICS OF THE PHOSPHATE INTERACTION WITH CALCITE,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
For primary bibliographic entry see Field 5B.
W74-06895

AZIDE AND ETHYLENETHIOUREA MOBILITY IN SOILS,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5B.
W74-06896

NITROGEN MINERALIZATION-WATER RELATIONS IN SOILS,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5B.
W74-06897

MINERAL NITROGEN MOVEMENT INTO SUBSOILS FOLLOWING CONTINUED ANNUAL FERTILIZATION FOR CORN,
Minnesota Univ., St. Paul. Dept. of Soil Science.
For primary bibliographic entry see Field 5B.
W74-06898

A COMPARISON OF HYDRAULIC CONDUCTIVITIES CALCULATED WITH MORPHOMETRIC AND PHYSICAL METHODS,
Wisconsin Univ., Madison. Dept. of Soil Science.
J. Bouma, and J. L. Denning.
Soil Science Society of America Proceedings, Vol 38, No 1, p 124-127, January-February 1974. 5 fig, 1 tab, 11 ref.

Descriptors: *Hydraulic conductivity, *Adsorption, Soil moisture, Analytical techniques, Laboratory tests, Moisture content, Pores, Porosity, Soil water.
Identifiers: *Moisture retention.

Hydraulic conductivity (K) of coarse porous media with packing pores could be calculated not only by physical methods but also with morphometric techniques if matching factors were used. Morphometric K curves are closest to physical curves derived from moisture adsorption characteristics. The morphometric technique can be applied exclusively to small or fragile homogeneous soil materials that cannot be sampled for moisture retention determinations in the laboratory. The pore interaction model of Marshall overestimated K(sat) when morphometric data were used. Moisture retention curves calculated with morphometric data, agreed well in coarse porous media with physical adsorption curves. (Knapp-USGS)
W74-06899

FIELD MEASUREMENT OF EVAPORATION FROM SOIL SHRINKAGE CRACKS,
Agricultural Research Service, Temple, Tex. Blackland Conservation Research Center.
For primary bibliographic entry see Field 2D.
W74-06900

ESTIMATING SOIL EROSION FROM THE REDISTRIBUTION OF FALLOUT CS-137,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 2J.
W74-06901

AN ISOKINETIC SAMPLER FOR WIND EROSIBLE SILT AND CLAY PARTICLE MEASUREMENT,
Illinois Univ., Urbana. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W74-06902

EFFECT OF VARYING THE ON-OFF TIME OF RAINFALL SIMULATOR NOZZLES ON SURFACE SEALING AND INTAKE RATE,
Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center.
For primary bibliographic entry see Field 2J.
W74-06903

BUFFER INTENSITIES AND EQUILIBRIUM PH OF MINERALS AND SOILS: 1. THE CONTRIBUTION OF MINERALS AND AQUEOUS CARBONATE TO PH BUFFERING,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soil Science and Geology.
N. Van Breemen, and W. G. Wielemaker.
Soil Science Society of America Proceedings, Vol 38, No 1, p 55-60, January-February 1974. 2 fig, 1 tab, 16 ref.

Descriptors: *Water chemistry, *Hydrogen ion concentration, *Weathering, Mineralogy, Alkalinity, Carbon dioxide, Silicates, Equilibrium, Carbonates, Aqueous solutions, Soil chemistry.
Identifiers: *Buffering(pH).

Thermodynamic equilibrium considerations were used to calculate pH buffer intensities for a number of aqueous systems involving 16 common soil and rock minerals (gibbsite, kaolinite, allophane, hematite, limonitic iron oxide, quartz, amorphous silica, calcite, siderite, hydrated magnetite + amorphous Fe(OH)3, microcline, albite, anorthite, Mg-montmorillonite, two illites, and Mg-chlorite), gaseous CO2 and 26 dissolved species. The calculation of buffer intensities is outlined for simple oxides and carbonates and for silicate minerals during congruent and incongruent dissolution. Silicate minerals, carbonates and gibbsite provide strong buffering upon addition of strong acid under slightly alkaline to slightly acid conditions. Carbon dioxide at constant partial pressure is far more effective than any of the minerals considered in counteracting the effect of an increase in alkalinity. (See also W74-06905) (Knapp-USGS)
W74-06904

BUFFER INTENSITIES AND EQUILIBRIUM PH OF MINERALS AND SOILS: II. THEORETICAL AND ACTUAL PH OF MINERALS AND SOILS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soil Science and Geology.
N. Van Breemen, and W. G. Wielemaker.
Soil Science Society of America Proceedings, Vol 38, No 1, p 61-66, January-February 1974. 2 fig, 2 tab, 36 ref.

Descriptors: *Water chemistry, *Hydrogen ion concentration, *Weathering, Mineralogy, Alkalinity, Carbon dioxide, Silicates, Equilibrium, Carbonates, Aqueous solutions, Soil chemistry.
Identifiers: *Buffering(pH).

Equilibrium pH values of different clay minerals, oxides and carbonates at pCO2 of 0.01 atm are between 4.5 and 8, in the range typical for most soils. The agreement between the calculated pH and the abrasian pH for most minerals is reasonable. The pH of a number of soils can be explained

by partial equilibrium between the soil solution and kaolinite, allophane, gibbsite, montmorillonite or calcite. For illite the agreement is less satisfactory. The effects of reducing conditions and the possible role of pH buffering by organic matter are discussed briefly. Application of the phase rule indicates that the specific mineral assemblage of acid sulfate soils provides a nearly ideal pH-stat; addition of moderate amounts of sulfuric acid or lime hardly affects the pH. (See also W74-06904) (Knapp-USGS)
W74-06905

EVALUATION OF INFLUENCE OF AVAILABLE SOIL WATER STORAGE CAPACITY ON GROWING SEASON LENGTH AND YIELD OF TROPICAL PASTURES USING SIMPLE WATER BALANCE MODELS,
Commonwealth Scientific and Industrial Research Organization, Townsville (Australia). Div. of Tropical Pastures.
For primary bibliographic entry see Field 3F.
W74-06927

TRANSFORMATION OF IRON IN A WATER-LOGGED SOIL AS INFLUENCED BY REDOX POTENTIAL AND PH,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-06934

SOLUTE MOVEMENT THROUGH DISTURBED AND UNDISTURBED SOIL CORES,
North Dakota State Univ., Fargo. Dept. of Soils.
For primary bibliographic entry see Field 5B.
W74-06935

THERMODYNAMICS OF ION EXCHANGE,
Technion - Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
I. Ravina, and J. DeBock.
Soil Science Society of America Proceedings, Vol 38, No 1, p 45-49, January-February 1974. 2 tab, 13 ref.

Descriptors: *Ion exchange, *Clays, *Water chemistry, Thermodynamics, Sorption, Cation exchange, Chemical potential, Ionization, Free energy.

A local formulation of nonequilibrium thermodynamics was used to define the electrochemical potentials in the ion-clay-water system, thus enabling development of an improved nonempirical approach to cation-exchange processes. The presence of the electrical field in the system is expressed by a proportional increase of the pressure in the double layer. The effect of the electrical field on the chemical potentials of the exchangeable cations is divided into the common electrostatic term and a term dependent on their polarizabilities. For systems containing a mixture of monovalent ions the electrostatic effect of the electrical field is the same for each of the exchangeable cations. Using values of the polarizabilities and intrinsic volumes of the alkali metal cations, the free energies of exchange with sodium in montmorillonite were calculated. The calculated free energies were in good agreement with experimental values. (Knapp-USGS)
W74-06936

GRAY FOREST SOILS IN THE SPRUCE-FIR FORESTS IN THE SUB-URAL REGION (VYATKA-KAMA PROVINCE), (IN RUSSIAN),
Leningrad State Univ. (USSR).
A. A. Khantulev, A. S. Schastnaya, and I. A. Tereshenkova.
Biol Nauki. Vol 15, No 12, p 125-129, 1972. Illus.
Identifiers: Fir, *Forest soils, Forests, Humus, Metabolites, Minerals, *Soils, Spruce, *USSR(Vyatka-Kama province), Hydrogen ion concentration.

Comparative studies were conducted on soil samples obtained from the USSR interfluvial region of the Vyatka-Cheptsa river in the Vyatka-Kama province, and soil samples from the Kaluga, Belgorod and Ryazan oblasts forest steppes. There were no meaningful differences with respect to humus, Ca, Mg, metabolites or pH between the different samples. This similarity in the nature of the gray forest soils is significant, since different bioclimatic factors were responsible for their formation.--Copyright 1973, Biological Abstracts, Inc.
W74-07004

A MULTICHANNEL SYRINGE PUMP FOR STEADY STATE FLOW IN SOIL COLUMNS,
New Mexico State Univ., University Park. Dept. of Agronomy.
P. J. Wierenga, R. J. Black, and P. Manz.
Soil Sci Soc Am Proc. Vol 37, No 1, p 133-135. 1973. Illus.
Identifiers: Control, Leaching, *Pumps(Syringe), *Soil columns, *Steady-state slow.

A multichannel syringe pump was designed for maintaining a constant rate of outflow over long periods of time. Low flow rates are obtained by using a timer-control which causes the pump to make 1 cycle/set time interval. The pump is not pulse free, but for many studies requiring steady state water movement in soil columns this is not considered too great a disadvantage. Measured over a 10-day period at a rate of outflow of 173 ml/day, the mean day-to-day variation was less than 0.2 ml/day.--Copyright 1973, Biological Abstracts, Inc.
W74-07028

PHYSICAL MICROCLIMATES OF EROSION-CONTROL STRUCTURES IN A SALT DESERT AREA,
Alberta Univ., Edmonton. Dept. of Botany.
R. W. Wein, and N. E. West.
J Appl Ecol. Vol 9, No 3, p 703-719. 1972. Illus.
Identifiers: *Climates, Desert areas, Erosion control, *Evaporation, Salt desert areas, Soil temperature, Temperature, *Utah, Winds.

A study of the physical microclimates of gully plugs and contour furrows was carried out in a salt desert area of southeastern Utah. Net radiation soil surface temperature and soil water evaporation were measured in the environs of these eroison-control structures. Net radiation rates varied with soil color, slopes, and aspects of the gully plugs and contour furrows. Soil-surface temperatures reached values in excess of 60C for level soils and aspects in July. The northern aspects reached 58C at this time. These temperatures are above the recognized upper limit of tolerance for plant tissue. No differences in evaporation occurred among positions or aspects of gully plugs and contour furrows. This indicates that the dry winds of the area have a great influence on soil water evaporation from bare soil.--Copyright 1973, Biological Abstracts, Inc.
W74-07029

SEASONAL AND STRATIGRAPHIC CONTROLS IN COASTAL FLOODPLAIN SOILS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
P. H. Walker.
Aust J Soil Res. Vol 10, No 2, p 127-142. 1972. Illus.
Identifiers: Aeration, *Australia(Macleay River), Coastal plains, Estuarine environment, *Flood plains, Particle, Salinity, Seasonal, Sediments, *Soils, *Stratigraphic controls, Swampland, Water table.

Soils of the Macleay River, Australia, coastal floodplain are developed in a relatively thin veneer of alluvium which is underlain by extensive estuarine deposits representing the postglacial rise of sea level. Soil particle size, water table, salt, and pH distributions relate to catenary variations from levee to back swamp and acid aeration products derived from the underlying estuarine beds. Groundwater data from 50 swampland locations for the period 1962-1968 showed strong seasonal trends. At 39 sites, water-table level correlated closely and positively ($P < 0.05$) with rainfall summed for the 6 mo. (log R6) prior to the month of sampling. Groundwater salinity at 20 sites correlated negatively ($P < 0.05$) with water-table level. Surface soil salinity up to 7.8% and groundwater pH as low as 2 were recorded during the 7-yr period. Reserves of estuarine sediment occurred in certain swamplands which were capable of further acid production. Programs of swamp drainage need to avoid exposure of these reserves. A system of shallow drains, set no deeper than the upper limit of the estuarine deposits, could be used both to remove excess flood water from back swamps and to remove salts produced by aeration of the estuarine materials.--Copyright 1973, Biological Abstracts, Inc.
W74-07030

ONE-DIMENSIONAL VERTICAL INFILTRATION,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div of Environmental Mechanics.
T. Talsma, and J. Y. Parlange.
Aust J Soil Res. Vol 10, No 2, p 143-150. 1972. Illus.
Identifiers: Equations, *Hydraulic conductivity, *Infiltration(Vertical), *Sorptivity.

Various concise equations were proposed, and used, to describe the dynamics of 1-dimensional, vertical, infiltration into uniform soils. Such equations, even when initial and boundary conditions are satisfied, do not describe infiltration with equal accuracy for all materials, especially when applied over a large time interval. Recently proposed equations appear more reliable and require only 2, easily measurable, soil properties, viz., sorptivity and hydraulic conductivity, for application in most practical situations. Numerical, laboratory, and field data are presented. These adequately support the reliability of the solutions. The applicability of the solutions to field soils with systematically varying conductivity is more restricted than the 2 or 3-dimensional solutions.--Copyright 1973, Biological Abstracts, Inc.
W74-07034

EFFECT OF PLANT GROWTH AND FORM OF NITROGEN FERTILIZER ON DENTRIFICATION FROM FOUR SOUTH AUSTRALIAN SOILS,
Waite Agricultural Research Inst., Glen Osmond (Australia).
R. C. Stefanson.
Aust J Soil Res. Vol 10, No 2, p 183-195. 1972.
Identifiers: *Australia, Biological studies, *Denitrification(Soils), Fertilizers, *Nitrogen fertilizer, *Plant growth, Soils, Wheat.

In measuring losses of volatile N in sealed growth chambers, 4 major wheat-growing soils were used, namely, a mallisol, a red-brown earth, a calcareous sand, and a grey-brown soil of heavy texture. The rate of loss varied 1-15 mg N/(kg soil/wk) when nitrate N was applied to the soil; when ammonium N was used, losses were 1-4 mg N/(kg soil/wk) over a 6-wk period. The major component of these losses was N gas with lesser quantities of N_2O. Both gases were produced by biological denitrification of soil nitrate. This was confirmed with an incubation experiment which used a portion of the same samples of soil. When nitrate N was applied to the soil, denitrification was increased by increasing soil water content and plant growth. These effects were greatest in the heavy-textured soils. The application of ammonium N to the red-brown earth, amllisol, and gray-brown soil of heavy texture reduced the losses of soil N as N

gas and N2O. Considerable losses of soil N were recorded for the calcareous sand when ammonium N was applied. Plant growth did not affect the losses of soil N from these soils receiving ammonium N.--Copyright 1973, Biological Abstracts, Inc.
W74-07039

SOIL MOISTURE DISTRIBUTION DURING TWO-DIMENSIONAL ABSORPTION FROM A CYLINDRICAL SOURCE,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Environmrntal Mechanics.
T. Talsma, J. Y. Parlange, and P. H. Groenevelt.
Aust J Soil Res. Vol 10, No 2, p 209-214. 1972. Illus.
Identifiers: *Absorption, Diffusivity, *Distribution, *Soil moisture, Sand, Porous media.

The moisture content distribution in fine sand, during 2-dimensional, horizontal, absorption from a cylindrical source, was analyzed using a recently developed theory. Well-justified approximations yield the result that, for a particular rigid porous medium, the time course of the moisture profile depends only on 2 functions, each of which depends on the moisture diffusivity function. This permits the reduction to a common basis of experimental results on a single soil, using different source dimensions and sampling at different times. Moisture profiles, obtained experimentally after various absorption times with 2 source radii, were in satisfactory agreement with the theory.--Copyright 1973, Biological Abstracts, Inc.
W74-07042

2H. Lakes

NITROGEN TURNOVER IN IMPOUNDMENTS,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W74-06505

PHYTOPLANKTON POPULATIONS IN RELATION TO DIFFERENT TROPHIC LEVELS AT WINNIPESAUKEE LAKE, NEW HAMPSHIRE, U.S.A.,
New Hampshire Univ., Durham. Dept. of Botany.
For primary bibliographic entry see Field 5C.
W74-06529

THE EFFECTS OF ECOLOGICAL CHANGES ON BUCKEYE LAKE, OHIO, WITH EMPHASIS ON LARGEMOUTH BASS AND AQUATIC VASCULAR PLANTS,
Bureau of Sport Fisheries and Wildlife, Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-06546

ESTABLISHMENT OF MEAN HIGH WATER LINES IN FLORIDA LAKES,
Florida Univ., Gainesville. Water Resources Research Center.
J. H. Davis, Jr.
Available from the National Technical Information Service as PB-231 302, $3.75 in paper copy, $1.45 in microfiche. Publication No. 24, November 1, 1973. 53 p, 11 fig, 3 ref. OWRR A-015-FLA(1). 14-31-0001-3209, 14-31-0001-3509, 14-31-0001-3809.

Descriptors: *Lakes, *High water mark, *Boundaries(Property), Water level fluctuations, *Florida, Aquatic plants, *Dating, *Dendrochronology.

This project was undertaken to provide a method of detecting former highwater levels by using plants presently growing in, and near, Florida lakes. Species, position, growth form, and other characteristics were used to develop viable statistics. The project was not intended for final legal determinations of former mean highwater lines but for the determination, where applicable flora exists, of the physical location of the boundary between riparian land and state-owned lake bottoms to assist in the formulation of a state policy for the establishment of mean high-water monuments in Florida lake basins. Results show this botanical method can be used in some cases with a high degree of reliability to date shoreline water positions back to 1845, when Florida became a state. The inspections of lake shores not only included the vegetation and particular plants, especially large old trees, but also some of the geology, soils, sediments, and the stage records of lake levels. The Cabinet Board of Trustees of the Internal Improvement Trust Fund and the State Bureau of Geology collaborated in this study. (Morgan-Florida)
W74-06610

DENITRIFICATION AS A PATHWAY FOR NITRATE REMOVAL IN AQUATIC SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-06612

DISTRIBUTION AND MIXING OF INFLOW INTO STRATIFIED LAKES: A HYDRAULIC MODEL STUDY, (PHASE I),
Oklahoma State Univ., Stillwater. School of Mechanical and Aerospace Engineering.
P. M. Moretti, and D. K. McLaughlin.
Available from the National Technical Information Service as PB-231 311, $3.75 in paper copy, $1.45 in microfiche. Oklahoma Water Resources Research Institute, Stillwater, Completion Report, (1973). 54 p, 12 fig, 1 tab, 30 ref. OWRR A-044-OKLA(2).

Descriptors: *Dispersion, Lakes, *Mixing, *Stratification, *Hydraulic models, Model studies, *Distribution patterns, Simulation analysis.
Identifiers: OSU stratified lake model, *Vertical distortion.

The similitude problems in modeling flow in stratified lakes was investigated both theoretically and experimentally. Models with transparent sides were built with representative inlets. Using salt solutions of varying density and coloration, the establishment of stratified conditions, the control and modeling of inlet flows, and the use of visualization methods were developed. Special attention was given to the problem of vertical distortion: in the modeling of lakes, it is necessary to use a different depth scale than the horizontal length scale. Too little vertical depth in the model allows boundary layer effects to dominate; too much depth and distortion may invalidate the similitude of the model to the lake. Two models with different amounts of vertical distortion were built and compared. The modeling technique was developed to the point where consistent results are attainable. Quantitative methods using photographic sequences and computer analysis of time lines were used to show the basic flow patterns of inlet flows into stratified lakes, and to show the application and limitations of vertical scale distortion.
W74-06618

UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES,
Bendix Corp., Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W74-06698

ERTS-1 OBSERVES ALGAL BLOOM IN LAKE ERIE AND UTAH LAKE,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-06699

DETERMINATION OF LAND USE IN MINNESOTA BY AUTOMATIC INTERPRETATION OF ERTS MSS DATA,
Honeywell, Inc., St. Paul, Minn. Systems and Research Center.
For primary bibliographic entry see Field 4A.
W74-06702

STUDIES ON THE PHOTOSYNTHETIC PIGMENTS AND THEIR DECOMPOSITION IN THE SEDIMENT OF LAKE BALATON AND LAKE BELSO,
Magyar Tudomanyos Adademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 5C.
W74-06741

HORIZONTAL PHYTOPLANKTON STUDIES IN LAKE BALATON BASED ON SCOOPED SAMPLES AND FILTRATES TAKEN IN 1967,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
For primary bibliographic entry see Field 5C.
W74-06756

ENERGETICS OF DAPHNIA AMBIGUA,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 5C.
W74-06831

THE RUNOFF OF WATER AND NUTRIENTS FROM WATERSHEDS TRIBUTARY TO CAYUGA LAKE, NEW YORK,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 5B.
W74-06848

WATER AND NUTRIENT BUDGETS FOR CAYUGA LAKE, NEW YORK,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 5B.
W74-06849

MATERIALS INPUT OF LAKE CHAMPLAIN: A SYNOPTIC APPRAISAL,
Vermont Univ., Burlington. Dept. of Zoology.
M. Potash, and E. B. Henson.
Water Resources Bulletin, Vol 10, No 2, p 348-359, April 1974. 2 fig, 4 tab, 12 ref.

Descriptors: *Lakes, *Water quality, *Hydrologic budget, *Sedimentation, Dissolved solids, Conductivity, Eutrophication, Water pollution sources, *New York, *Vermont, Lake morphology, Lake morphometry, Path of pollutants.
Identifiers: *Lake Champlain.

In Lake Champlain (New York-Vermont), detailed, regional studies were made, and the results integrated, to yield total lake conditions. Using specific conductance measurements, and values of total dissolved solids calculated from them, an approach was made to assessing the materials budget of the lake. The sampling program involved inventorying all 319 tributaries, determining the watershed area for each, and dividing the Champlain basin into appropriate hydrographic regions. Data were obtained from samples collected from 41 selected streams (representing 97.5% of the annual water input), sampling occurring in all seasons of the year since 1970. Over one million metric tons of total dissolved solids enter Lake Champlain annually, about two-thirds (63%) from the eastern (Vermont) portion and almost one-fourth (22%)

from the western (New York) part of the drainage basin, the remainder (15%) entering from the south end. Of the total quantity added annually, 17.4% is retained in the lake, indicating that a solids buildup is occurring at a significant rate. Specific conductance, and therefore total dissolved solids, may be utilized as a convenient indicator of water quality conditions, and the results should be applied to permit more efficient watershed management. (Knapp-USGS)
W74-06882

WALDEN'S WAY REVEALED,
Geological Survey, Boston, Mass.
E. H. Walker.
Man and Nature, p 11-20, December 1971. 2 fig.

Descriptors: *Surface-groundwater relationships, *Water level fluctuations, *Lakes, *Massachusetts, Water balance, Glacial drift, Hydrogeology.
Identifiers: *Walden Pond(Mass).

The water level of Walden Pond, Massachusetts, rises and falls through seasons and years almost exactly in agreement with changes in local groundwater level. Walden occupies a glacial kettle. There probably are a few feet of sand and silt on the floor of Walden and underneath lies glacial till, and deeper is bedrock. The sand and gravel is highly pervious and yields hundreds of gallons of water per minute to a large number of town and industrial wells. The rise of water level in Walden and in the sand and gravel around it during winter and spring and the decline through summer and autumn is the normal change observed in almost all wells and water table ponds in this part of the country. Replenishment of groundwater occurs mainly in the cold months, when evaporation and plants return very little water to the air, and most of the water from rain and melting snow sinks into the ground. After plants start growing in spring their roots draw so much water from the soil that the soil becomes dry enough to absorb most of the rain that falls in summer. As a result, rain in summer provides scarcely any relenishment to groundwater reservoirs. Meanwhile, the water in the ground leaks away continually. So the water in the ground lowers all through the growing season. Walden Pond has been unusually low during the past several years. A decline that began in 1963 continued until, at the end of 1966, water level was about 6 feet below what is considered normal. The pond has risen gradually since early in 1967 but still is not quite back to its usual level. (Knapp-USGS)
W74-06925

PHYTOPLANKTON SUCCESSIONS AND LAKE DYNAMICS IN LAS VEGAS BAY, LAKE MEAD, NEVADA,
Nevada Univ., Reno.
For primary bibliographic entry see Field 5C.
W74-07001

PRODUCTION AND BIOGENIC ACTIVITY OF DISTILLATES, FILTRATES AND EXTRACTS FROM THE POMORIE AND ATANASOVO LAGOON MUD, (IN BULGARIAN),
S. Apostolov.
Dokl Sel'sko Khoz Akad Im Georgiya Dimitrova. Vol 5, No 1, p 51-56, 1972. Illus.
Identifiers: *Biogenic activity, *Bulgaria, Carotene, Distillates, Extracts, Fats, Filtrates, *Lagoons, Minerals, *Mud, Proteins, Rice, Vitamins, *Productivity, Salts.

The mud collected from the Atanasovo and Pomorie lagoons, Bulgaria, contains crude protein, fats, carotene, vitamins, Na, Mg and Fe salts. The filtrates and distillates stimulate the growth of rice seeds.--Copyright 1973, Biological Abstracts, Inc.
W74-07003

THE LAGUNA DE VEGUETA ON THE MID-PERUVIAN COAST AND ITS FISHES, PARTICULARLY AEQUIDENS RIVULATUS (GUENTHER 1859), (IN GERMAN),
Zoologisches Forschungsinstitut und Museum Alexander Koenig, Bonn (West Germany).
K. H. Lueling.
Zool Beitr. Vol 19, No 1, p 93-108, 1973. Illus.
Identifiers: *Aequidens-rivulatus, Bryconamericus-peruanus, Coasts, Dorminator-latifrons, *Fishes, Lebiasina-bimaculata, Pimelodella-yuncensis, *Lagoons, *Peru(Laguna de Vegueta).

The Laguna de Vegueta is an elongated tub-shaped lagoon in mid-Peru, north of the community of Hacho on the Pacific Ocean. This lagoon and its fishes were studied in 1970-1971. The biologic and hydrologic relationships governing this location are described. Its climate is moderated by the Humboldt current. Quite near the shores of the lagoon are salt deposits, as a result of which the water is distinctly salty. However, the lagoon is fed by wells supplying pure, crystal-clear earth-filtered fresh water. The fish species represented in the lagoon include Bryconamericus peruanus, Lebiasina bimaculata, Aequidens rivulatus, Pimelodella yuncensis, Dorminator latifrons. A map of northwestern South America shows several locations where Aequidens rivulatus was found.--Copyright 1973, Biological Abstracts, Inc.
W74-07007

SYSTEMS ANALYSIS IN THE MARION LAKE IBP PROJECT,
British Columbia Univ., Vancouver.
For primary bibliographic entry see Field 5C.
W74-07010

BENTHIC ALGAE IN WATER OF THE NEOUVIELLE MASSIF (HAUTES-PYRENEES),
Paul Sabtier Univ., Toulouse (France).
W. K. Besch, D. Backhaus, J. Capblanq, and P. Lavandier.
Ann Limnol. Vol 8, No 2, p 103-118, 1972. Illus. (English summary).
Identifiers: *Algae, Benthos, *Diatoms, Distribution, *France(Neouvielle Massif), Lakes, Pyrenees, Zonation.

Ninety-three diatom species are reported from a spring, a cold stenothermic stream and 2 lakes in the Neouvielle Massif (France). Among the commoner diatoms a zonation was apparent, both along the stream and according to depth in Lake Port-Bielh. The spatial distribution of the commoner species, and the factors may cause it, are discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-07013

ATLANTIC STURGEON (ACIPENSER STURIO) IN WATERS OF GEORGIA, (IN RUSSIAN),
N. Sh. Nunua.
Biol Nauki. Vol 15, No 9, p 27-90, 1973. Illus.
Identifiers: Acipenser-sturio, *Ecology, *Sturgeon(Atlantic), *USSR(Georgia), *Black Sea.

Data are given on the ecology of the Atlantic sturgeon (Acipenser sturio) in the Black Sea and Rioni River in Georgia, USSR. The Atlantic sturgeon has adapted well to habitation in the Black Sea. Artifical reproduction can restore the stock of the sturgeon in the Rioni River and reacclimatize it in the Baltic Sea.--Copyright 1973, Biological Abstracts, Inc.
W74-07016

CORRELATION BETWEEN CO2 AND O2 CONCENTRATIONS IN LAKE ERIE, USA,
State Univ. Coll., Fredonia, N.Y.
For primary bibliographic entry see Field 5C.
W74-07025

SPRING FOOD OF CHAIN PICKEREL (ESOX NIGER) IN MAINE LAKES,
Maine Dept. of Inland Fisheries and Game, Bangor.
K. Warner.
Trans Am Fish Soc. Vol 102, No 1, p 149-151. 1973.
Identifiers: *Chain pickerel, Crayfish, Esox-niger, *Fish foods, Frogs, Insects, Lakes, *Maine, Salamander.

Frequency of occurrence of food items in the stomachs of chain pickerel from 18 Maine lakes in May 1967-1970 show mostly fish species and a few insects, crayfish, frogs, and salamanders.--Copyright 1973, Biological Abstracts, Inc.
W74-07032

EFFECTS OF ALEWIVES (ALOSA PSEUDOHARENGUS) ON THE ZOOPLANKTON OF LAKE WONONSKOPOMUS, CONNECTICUT,
Naval Medical Research Inst., Bethesda, Md.
S. J. Warshaw.
Limnol Oceanogr. Vol 17, No 6, p 816-825. 1972. Illus.
Identifiers: *Alewives, Alosa-pseudoharengus, *Connecticut(Lake Wononskopomus), Daphnia-galeata-mendotae, Lakes, Plankton, *Zooplankton(Limnetic), *Predation.

The effects of predation by alewives (A. pseudoharengus) on the limnetic zooplankton of Lake Wononskopomuc, Connecticut were examined over several years. Shifts in zooplankton composition and size distribution toward small forms were apparent 8 yr after alewife introduction. A partial reversal of these effects, including an increase in the abundance of large species and a size increase in at least one species, Daphnia galeata mendotae, followed an alewife die-off.--Copyright 1973, Biological Abstracts, Inc.
W74-07033

THE EFFECT OF SEASON AND ANIMAL SIZE ON THE CALORIC CONTENT OF DAPHNIA PULICARIA FORBES,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
N. B. Snow.
Limnol Oceanogr. Vol 17, No 6, p 404-413. 1972. Illus.
Identifiers: *Caloric content, *Canada(West Blue Lake-Manitoba), *Daphnia-pulicaria, Energy content, Fat, Growth, Season, Size, Aquatic animals.

The population of D. pulicaria in West Blue Lake, Manitoba (Canada) was sampled monthly for over a year. Very small animals were entirely absent during winter when no reproduction was occurring, while large, red, fat-laden individuals were more numerous than at any other time. In spring, large numbers of small animals appeared and the largest size classes virtually disappeared, to reappear the following winter. The large, fat, winter animals had a very high energy content (approximately 9000 cal/g dry wt.) whereas smaller individuals at the same time had values similar to those later in summer. Caloric content of all sizes decreased as summer progressed (approximately 4900 cal/g dry wt.) and the inequality between different sizes also disappeared. During Nov. the mean caloric content began to rise again and once more large animals had higher values than smaller ones.--Copyright 1973, Biological Abstracts, Inc.
W74-07038

DISTRIBUTION AND CIRCULATION OF ARSENIC THROUGH WATER, ORGANISMS AND SEDIMENTS OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. School of Natural Resources.
For primary bibliographic entry see Field 5B.
W74-07046

2I. Water In Plants

NATURAL PHYTOCENOSES OF THE RIVER LITTORAL IN THE LOWER REACHES OF THE RIVER HRON,
Komenskeho Universita, Bratislava (Czechoslovakia). Dept. of Geobotany.
L. Somsak.
Acta Fac Rerum Nat Univ. Comenianae Bot. 20. p 1-91. 1972. Illus.
Identifiers: *Czechoslovakia(Hron River), Dicots, Monocots, Rivers, *Phytocenoses, *Littoral(River).

Ecological characteristics and floristic composition of 5 associations identified as littoral associations of the lower reaches of the Hron river in Slovakia(Czechoslovakia) are described. The association Polygono Chenopodietum is characterized by Persicaria lapathi-folia, Chenopodium rubrum, C. glaucum and C. polyspermum. The association Polygono Bidentetum is characterized by Persicaria hydropiper, P. minor, Bidens tripartitus, the association Heleocharis acicularis-Limosella aquatica by R. amphibia and Eleocharis acicularis, the association Rorippo-Agrostietum by Agrostis stolonifera, R. silvestris and Barbaraea vulgaris, the association Rorippo-Phalaridetum arundinaceae by Baldingera arundinaceae, Calamagrostis pseudophragmites, Calystegia sepium, Carex hirta and Equisetum arvense.--Copyright 1973, Biological Abstracts, Inc.
W74-06550

AN ECOLOGICAL STUDY OF VELLOZIA SCHNITZLEINIA, A DROUGHT-ENDURING PLANT OF NORTHERN NIGERIA,
Ife Univ. (Nigeria). Dept. of Biological Sciences.
A. J. Owoseye, and W. W. Sanford.
J Ecol. Vol 60, No 3, p 807-817. 1972. Illus.
Identifiers: Chloroplast, Cultivation, Cyanin, *Drought response(Plants), Ecological studies, *Nigeria, Sucrose, *Vellozia-Schnitzleinia-Var-Occidenta.

Vellozia schnitzleinia var. occidentalis, known to occur only in a restricted area of northern Nigeria, was observed in situ and under cultivation. Its habitat is described. The plant is particularly remarkable for its rapid response to drought, and the ability of its leaves to survive over 5 mo. without water and to 'resurrect' within a few days after the onset of rains. Under cultivation, plants become quiescent whenever water is withheld. Within 24 hr, chloroplasts in the leaf mesophyll begin to fragment and they completely disappear within 3-5 days. At the same time, anthocyanin develops abaxially in the cells adjoining the fibers of the midrib and in the translucent cells surrounding the vascular bundles. Leaves become brown-purple, brittle and adaxially folded. Sucrose content of leaves, on a dry-weight basis, increases above the normal. With watering, chloroplasts begin regenerating within 24 hr, anthocyanins quickly disappear and sucrose content drops, for a time, below normal.--Copyright 1973, Biological Abstracts, Inc.
W74-06768

PREDATION ON THE FRESHWATER BIVALVE UNIO PICTORUM BY THE RAT, RATTUS NORVEGICUS, (IN ITALIAN),
Parma Univ. (Italy). Istituto di Zoologia e Anatomia Comparata.
G. Gandolfi, and V. Parisi.
Ateneo Parmense Acta Nat. Vol 8, No 1, p 5-31, 1972. Illus. (English summary).
Identifiers: Anodonta-cygnaea, Bivalves, Cerastoderma-lamarcki, Planorbarius-corneus, *Italy(River Taro), *Predation, Rattus-norvegicus, Rivers, Unio-pictorum, Viviparus-ater, Viviparus-contectus, *Rodents, *Mollusks(Bivalve).

Cases of predation by R. norvegicus (Berkenhout) on the freshwater mollusk U. pictorum are considered in conjunction with information on predation by the same rodent on bivalve mollusks Anodonta cygnaea and Cerastoderma lamarcki and on the gastropods Viviparus ater, V. contectus and Planorbarius corneus. In the case of U. pictorum 6 stations along a 1500-m stretch of the River Taro (Italy) and 2 stations more than 100 km away were studied. The techniques used to open U. pictorum, deducible from the shell breaks, lead to some ethologic considerations. The differences in habits between colonies of rats in the field and between their methods of breaking bivalve mollusks and those of unexperienced laboratory rats suggest some hypotheses concerning cultural transmission based on observational learning. The incidence of predation on the population of U. pictorum also has a definite ecologic significance in that a large fraction of the secondary production of the river ecosystem is exported by this route, and the rat is the chief biotic factor in U. pictorum population control in the studied areas.--Copyright 1973, Biological Abstracts, Inc.
W74-07008

CHANGES IN RATE AND RHYTHMS OF DEVELOPMENT OF PERENNIAL POLYCARPIC PLANTS AT DIFFERENT ALTITUDES IN HUMID HIGH MOUNTAINS, (IN RUSSIAN),
A. A. Malyshev.
Bot Zh. Vol 57, No 9, p 1069-1081. 1972. English summary.
Identifiers: Altitudes, Anthemis, Bromus, Centaurea, Festuca, Fritillaria, Humid, Mountains, Muscari, Perennials, *Polycarpic plants, Polygonum, Primula, Pulsatilla, Scabiosa, *USSR(Caucasus).

The reorganization of developmental cycles of perennial polycarpic plants (Polygonum, Scabiosa, Aetheopappus (Centaurea), Anthemis, Pulsatilla, Muscari, Fritillaria, Primula, Festuca and Bromus) after transplantation from one altitudial level to the other from northeast Altai and northwest Caucasus (USSR) was studied. Cultural and spontaneous perennial polycarpic plants adapt themselves to the short vegetational period of mountains by means of morphogenetic reorganization of their short developmental cycles. Up to the upper limits of the middle-mountainous zone (i.e., up to the 2000 m height in the Caucasus and up to the 1000 m height in Altai) the number of yearly developmental cycles observed in shoots of one generation in plants is the same as on the plain. In the alpine belt or in the transitional part of subalpine belt (Caucasus-2400-2700 m, Altai-1750) generative development of plants is less intensive. In species studied shoots here form an extra yearly cycle. This morphogenetic delay in ontogenesis facilitates the increase of yearly cycles of generative development of plants. In the year of fruiting the shoots of perennials develop faster in conditions of high mountains than in lower zones, forming seeds earlier. This is explained by the fact that buds are more developed and by development of plants in favorable conditions of longer days and more intensive insolation.--Copyright 1973, Biological Abstracts, Inc.
W74-07014

AN ANNOTATED LIST OF THE SUMMER VERTEBRATE FAUNA OF UPPER LUSK CREEK, POPE COUNTY, ILLINOIS,
Eastern Kentucky Univ., Richmond. Dept. of Biological Sciences.
M. P. Thompson, Jr.
Trans Ky Acad Sci. Vol 33, No 3/4, p 49-56. 1972.
Identifiers: Abundance, Creeks, Distribution, *Fauna(Vertebrates), *Illinois(Lusk Creek), Moxostoma-duquesnei, Rana-sylvatica, Scaphiopus-holbrooki, Summer.

A summer survey of the vertebrates of the Lusk Creek Basin in Southeastern Illinois produced 120 species, including 27 fishes, 13 amphibians, 14 reptiles, 53 birds, and 22 mammals. The spadefoot toad (Scaphiopus holbrooki), wood frog (Rana sylvatica) black redhorst (Moxostoma duquesnei), and other species unreported or uncommon in the locality were collected. A phylogenetic list of forms was compiled with annotations on local distribution, abundance, and habitat preference.--Copyright 1973, Biological Abstracts, Inc.
W74-07036

SOCIAL INTERACTION BETWEEN JUVENILE COHO (ON-CORHYNCHUS KISUTCH) AND FALL CHINOOK SALMON (O. TSHAWYTSCHA) IN SIXES RIVER, OREGON,
Wisconsin Univ., Madison. Lab. of Limnology.
R. A. Stein, P. E. Reimers, and J. D. Hall.
J Fish Res Board Can. Vol 29, No 12, p 1737-1748. 1972. Illus.
Identifiers: *Chinook salmon, *Coho salmon, Fish interaction, Juvenile fish, Oncorhynchus-kisutch, Oncorhynchus-tshawytscha, *Oregon(Sixes River), Rivers, Spawning.

Spawning and emergence of coho and fall chinook salmon overlapped in timing and location in Sixes River, Oregon. In early spring both species were distributed throughout most of the river system. Underwater observations during this period indicated that both species occupied the same habitat. As temperatures increased, coho disappeared from the main river, but continued to occupy cool tributaries. Fall chinook were found primarily in the main river until early summer, when they moved to the estuary. In flowing-water observation troughs coho assumed social dominance and defended space near the source of incoming food. In allopatry in the troughs, both grew at similar rates, but coho maintained lower population densities than did chinook. In sympatry in the troughs or in cool tributary streams, coho grew faster than chinook. Coho had brighter fin and body colors, greater fin development, deeper bodies, and were heavier than fall chinook of the same length. It is suggested that the population of fall chinook salmon in Sixes River might be adversely affected by an increase in numbers of coho. Evidence suggests that ecology of native fishes should be examined closely before widespread manipulation of fish stocks is encouraged.--Copyright 1973, Biological Abstracts, Inc.
W74-07040

OBSERVATIONS ON COMPARATIVE PROPENSITIES FOR CARP FRY DESTRUCTION BY ADULTS AND LAST INSTAR PREIMAGINAL STAGES OF PREDATORY AQUATIC INSECTS,
Taraporewala Marine Biological Research Station, Bombay (India).
G. A. Shirgur, and H. G. Kewalramani.
Proc Indian Acad Sci Sect B. Vol 76, No 3, p 85-89. 1972.
Identifiers: *Aquatic insects, *Carp fry, Catla-Catla, Cirrhina-Mrigala, Coleoptera, *Comparative studies, Cybister, Heteroptera, Labeo-Rohita, Odonata, *Predation.

Studies on comparative propensities for carp fry (Catala catla, Labes rohita, Cirrhina mrigala) destruction by preimaginals and imaginals of both Heteroptera and Coleoptera and Odonata nymphs, were made under laboratory conditions. Coleopterans, especially Cybister larvae, were the most predaceous of all the insects, whereas the Odonata nymphs the least. An interesting feature was observed in case of the preimaginals of Coleoptera and Heteroptera. The preimaginals display more carp fry destructive tendency than their respective adults.--Copyright 1973, Biological Abstracts, Inc.
W74-07044

2J. Erosion and Sedimentation

SOIL AND WATER LOSSES AS AFFECTED BY TILLAGE PRACTICES,
Agricultural Research Service, Brookings, S. Dak. Soil and Water Conservation Research Div.

For primary bibliographic entry see Field 3F.
W74-06595

RECOGNITION OF BEACH AND NEARSHORE DEPOSITIONAL FEATURES OF CHESAPEAKE BAY,
Maryland Geological Survey, Baltimore.
For primary bibliographic entry see Field 2L.
W74-06665

APPLICABILITY OF ERTS-1 IMAGERY TO THE STUDY OF SUSPENDED SEDIMENT AND AQUATIC FRONTS,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W74-06666

DISTRIBUTION AND MOVEMENT OF SUSPENDED SEDIMENT IN THE GULF OF MEXICO OFF THE TEXAS COAST,
Geological Survey, Corpus Christi, Tex.
For primary bibliographic entry see Field 2L.
W74-06672

RESERVOIR SEDIMENTATION,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
J. R. McHenry.
Water Resources Bulletin, Vol 10, No 2, p 329-337, April 1974. 1 fig, 2 tab, 18 ref.

Descriptors: *Reservoir silting, *Sedimentation, Erosion, Sediment control, Sediment yield, Desilting, Reservoir design, Reservoir operation, Water management(Applied), Sedimentation rates.
Identifiers: *Reservoir sedimentation.

Reservoirs, as well as lakes and estuaries, are subject to sediment accumulation. The rate at which sedimentation occurs is accelerated or diminished by man's activities. Acceptable rates of sedimentation may be determined on the basis of costs of sediment storage and removal. A review of reservoirs constructed with sediment removal capabilities is given. The rates of reservoir sedimentation in the United States are summarized based on reliable data obtained from all sizes of reservoirs. Problems confronting the engineer concerning reservoir construction and maintenance are discussed on the basis of these data. (Knapp-USGS)
W74-06883

HYDROGEOMORPHOLOGY,
Technische Hochschule, Vienna (Austria). Institut fuer Geophysik.
For primary bibliographic entry see Field 2A.
W74-06891

ESTIMATING SOIL EROSION FROM THE REDISTRIBUTION OF FALLOUT CS-137,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
J. C. Ritchie, J. A. Spraberry, and J. R. McHenry.
Soil Science Society of America Proceedings, Vol 38, No 1, p 137-139, January-February 1974. 2 fig, 3 tab, 18 ref.

Descriptors: *Soil erosion, *Tracers, *Fallout, *Radioisotopes, *Cesium, Erosion, Land use, Path of pollutants, *Mississippi, Watersheds(Basins).

The movement of fallout Cs-137 from soils in three north Mississippi watersheds is logarithmically ($r=0.89$) related to potential soil loss as calculated by the Universal Soil Loss Equation. Analysis of other published data also showed a significant ($r=0.95$) logarithmic relation existing between soil loss and Cs-137 loss from soils. It may be possible to calculate soil loss from the movement of fallout Cs-137 in watersheds. Also it may be possible to calculate the movement of surface adsorbed nutrients like Cs-137 in watersheds from soil erosion data. (Knapp-USGS)
W74-06901

AN ISOKINETIC SAMPLER FOR WIND EROSIBLE SILT AND CLAY PARTICLE MEASUREMENT,
Illinois Univ., Urbana. Dept. of Agricultural Engineering.
G. F. Arkin, and E. R. Perrier.
Soil Science Society of America Proceedings, Vol 38, No 1, p 151-152, January-February 1974. 1 fig, 2 tab.

Descriptors: *Sampling, *Soil erosion, *Wind erosion, Equipment, Particle size.
Identifiers: Wind tunnels.

A sampler for soil erosion studies enables rapid measurement of a totally representative profile distribution of soil particles entrained in a turbulent boundary layer within a wind tunnel test section. Differences between mass flux, soil particle concentration, and particle size distribution measured at the sampling point and in the air stream are minimized by isokinetic sampling. (Knapp-USGS)
W74-06902

EFFECT OF VARYING THE ON-OFF TIME OF RAINFALL SIMULATOR NOZZLES ON SURFACE SEALING AND INTAKE RATE,
Agricultural Research Service, Morris, Minn. North Central Soil Conservation Research Center.
L. L. Sloneker, and W. C. Moldenhauer.
Soil Science Society of America Proceedings, Vol 38, No 1, p 157-159, January-February 1974. 1 fig, 2 tab, 8 ref.

Descriptors: *Soil erosion, *Simulated rainfall, Infiltration, Model studies, Runoff, Soil surfaces, Surface sealing.

In many erosion studies, rainfall intensity is controlled by varying the on-off time of sprinklers. After a certain point, the energy to initiate runoff is increased as the nozzle off-time is increased. Water intake rate is increased as application rate is increased even though runoff is taking place. (Knapp-USGS)
W74-06903

KARST HYDROLOGY--A REVIEW,
Geological Survey, Raleigh, N.C.
For primary bibliographic entry see Field 2F.
W74-06907

STRUCTURE OF THE VELOCITY PROFILE OF A SUSPENSION-BEARING FLOW,
For primary bibliographic entry see Field 8B.
W74-06912

DEGREE OF LOCAL SATURATION OF A FLOW BY SUSPENDED MATTER AND ITS RELATION TO THE VOLUME CONCENTRATION,
For primary bibliographic entry see Field 8B.
W74-06913

THE INFLUENCE OF CLAY FRACTION ON THE BASIC PARAMETERS OF THE HYDROTRANSPORT OF FINE FREE-FLOWING MATERIALS,
For primary bibliographic entry see Field 8B.
W74-06914

DISTRIBUTION OF AVERAGE LONGITUDINAL VELOCITIES IN FLOWS WITH COARSE-GRAINED MATERIALS,
For primary bibliographic entry see Field 8B.
W74-06915

ENERGY LOSSES IN A TWO-PHASE FLOW CONTAINING COARSE-GRAIN MATERIAL.
For primary bibliographic entry see Field 8B.
W74-06916

SOME COMMENTS ON SEAGRASSES AND SEDIMENTARY PROCESSES,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
J. R. Schubel.
Special Report 33 (Reference 73-12), November 1973. 32 p, 8 fig, 26 ref.

Descriptors: *Sedimentation, *Vegetation effects, *Bottom sediments, *Grasses, Beaches, Surf, Erosion, Turbidity.
Identifiers: *Seagrasses.

Seagrasses alter the prevailing sedimentation processes in a variety of ways; their net effects are generally to increase the sedimentation rate, to preferentially concentrate the finer particle sizes, and to stabilize the underlying sedimentary deposits. These effects are produced by several processes: (1) by the direct and indirect extraction and entrapment of fine waterborne particles by the grass blades, (2) by the formation and retention of particles produced locally within the grass beds, (3) by the binding and stabilization of the sedimentary substrate by the grass rhizome and root systems, and (4) by the alteration of the chemical environment both of the overlying water and of the underlying sediments. (Knapp-USGS)
W74-06922

THE CBI POGO STICK CORER,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 7B.
W74-06923

HYDROLOGY AND WATER RESOURCES OF THE HOOSIC RIVER BASIN, MASSACHUSETTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-06958

WATER RESOURCES OF NORTHWESTERN MISSOURI,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-06961

2K. Chemical Processes

PHOSPHORIMETRIC DETERMINATION OF TRACES OF BORON,
Geneva Univ. (Switzerland). Dept. of Inorganic and Analytical Chemistry.
For primary bibliographic entry see Field 5A.
W74-06755

A UNIVERSAL ION-SELECTIVE ELECTRODE BASED ON GRAPHITE PASTE,
Connecticut Univ., Storrs. Dept. of Chemistry.
J. P. Sapio, J. F. Colaruotolo, and J. M. Bobbitt.
Analytica Chimica Acta, Vol 67, No 1, p 240-242, November 1973. 2 fig, 7 ref.

Descriptors: *Water analysis, *Nitrates, *Chlorides, *Calcium, *Design criteria, Aqueous solutions, Materials, *Electrodes.
Identifiers: *Ion-selective electrodes, Chemical interference, Detection limits, Universal electrodes.

A design is proposed for a universal ion-selective electrode which includes many of the advantages of the selectrode, but of a much simpler construction. The electrode consists of a graphite paste prepared from a liquid ion exchanger containing

the ion of interest and commercial graphite powder. Chloride, nitrate, and calcium ion-selective pastes were prepared for use in electrodes to be tested. The chloride and nitrate electrodes gave linear plots of E versus-log a over the activity range of 0.003-0.85 M with a slope of 54 mV/decade activity change. No interference occurred with the chloride electrode when 0.001 M Br, I, NO3, and ClO4 were present. The nitrate electrode was unaffected by 0.00001 M Cl, Br, I, and ClO4. The calcium electrode plot was linear over the activity range of 0.001-0.1 M with a slope of 30 mV/decade. At an activity level of 0.001 M Ca, 0.0001 M Mg and Ba and 0.01 M Na caused no interference. (Little-Battelle)
W74-06758

SELECTRODE - THE UNIVERSAL ION-SELECTIVE ELECTRODE. PART VI. THE CALCIUM (II) SELECTRODE EMPLOYING A NEW ION EXCHANGER IN A NONPOROUS MEMBRANE AND A SOLID-STATE REFERENCE SYSTEM,
Technical Univ. of Denmark, Lyngby. Kemisk Laboratorium A.
For primary bibliographic entry see Field 5A.
W74-06764

SELECTRODE - THE UNIVERSAL ION-SELECTIVE ELECTRODE. PART VII. A VALINOMYCIN-BASED POTASSIUM ELECTRODE WITH NONPOROUS POLYMER MEMBRANE AND SOLID-STATE INNER REFERENCE SYSTEM,
Lund Univ., (Sweden).
For primary bibliographic entry see Field 5A.
W74-06765

NEW METHODS OF NITRITE AND NITRATE ANALYSIS FOR NATURAL WATERS,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
For primary bibliographic entry see Field 5A.
W74-06836

ON THE REACTION BETWEEN IODIDE AND MERCURY(II),
Cairo Univ., Giza (Egypt). Faculty of Science.
For primary bibliographic entry see Field 5A.
W74-06870

ELECTRON-DONOR-ACCEPTOR COMPLEXING REAGENTS IN THE ANALYSIS OF PESTICIDES. VI. INFLUENCE OF STRUCTURE IN DETECTION AND IDENTIFICATION,
Dalhousie Univ., Halifax (Nova Scotia). Trace Analysis Research Centre.
For primary bibliographic entry see Field 5A.
W74-06871

CANCELLATION OF SPECTROPHOTOMETER SYSTEM CHARACTERISTICS USING AN ANALOG COMPUTER,
Department of Agriculture, Ottawa (Ontario). Engineering Research Service.
E. J. Brach, M. Montour, and G. St. Amour.
Laboratory Practice, Vol 22, No 10, p 631-632, October 1973. 6 fig, 2 ref.

Descriptors: *Spectrophotometery, *Analog computers, Potentiometers, Instrumentation, Electronic equipment.
Identifiers: Transmittance, Spectral response, Cancellation, Monochromators.

A method to cancel the effect of spectral and environmental characteristics of the components of a spectrophotometer on spectral response curves of the absorption characteristics of materials is discussed. The method uses analog computer techniques. The spectral range covered is from 450 to 1050 nm. The position of the wavelength drive is interfaced to the analog computer by a potentiometric voltage divider, acting as a linear wavelength to analog voltage converter. (Mortland-Battelle)
W74-06874

NITRIC OXIDE SORPTION BY CALCAREOUS SOILS: II. EFFECT OF MOISTURE ON CAPACITY, RATE, AND SORPTION PRODUCTS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
For primary bibliographic entry see Field 5B.
W74-06894

KINETICS OF THE PHOSPHATE INTERACTION WITH CALCITE,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
For primary bibliographic entry see Field 5B.
W74-06895

NITROGEN MINERALIZATION-WATER RELATIONS IN SOILS,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
For primary bibliographic entry see Field 5B.
W74-06897

BUFFER INTENSITIES AND EQUILIBRIUM PH OF MINERALS AND SOILS: 1. THE CONTRIBUTION OF MINERALS AND AQUEOUS CARBONATE TO PH BUFFERING,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soil Science and Geology.
For primary bibliographic entry see Field 2G.
W74-06904

BUFFER INTENSITIES AND EQUILIBRIUM PH OF MINERALS AND SOILS: II. THEORETICAL AND ACTUAL PH OF MINERALS AND SOILS,
Agricultural Univ., Wageningen (Netherlands). Dept. of Soil Science and Geology.
For primary bibliographic entry see Field 2G.
W74-06905

ELECTRO-OSMOTIC EFFECTS IN A BENTONITE-WATER SYSTEM,
Harcourt Butler Technological Inst., Kanpur (India). Dept. of Chemistry.
R. C. Srivastava, and P. K. Avasthi.
Journal of Hydrology, Vol 20, No 1, p 37-47, September 1973. 5 fig, 3 tab, 10 ref.

Descriptors: *Electro-osmosis, *Bentonite, *Electrochemistry, *Hydraulic conductivity, Darcys law, Clays, Equations, Membrane processes, Water chemistry, Clay minerals.

Measurements of the electro-osmotic velocity, streaming potential and hydraulic conductivity for a bentonite-water system are presented. The flow of electricity in the presence of both hydraulic pressure and electrical potential difference is given by the usual linear phenomenological equation, but the flow of water in the presence of both pressure and electrical potential gradients is given by a nonlinear exponential relationship. The relationship between water flux and pressure gradient in absence of electrical potential gradient is adequately represented by Swartzendruber's equation. Unless the applied potential difference exceeds a certain threshold value, the flow of water due to electro-osmosis does not take place. The plot of electro-osmotic velocity against applied potential difference, though linear, does not pass through the origin. The counter effect of streaming potential cannot account for the non-Darcian behavior. (Knapp-USGS)
W74-06910

CHEMICAL PROFILE OF THE ROSS ICE SHELF AT LITTLE AMERICA V, ANTARCTICA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-06921

TRANSFORMATION OF IRON IN A WATERLOGGED SOIL AS INFLUENCED BY REDOX POTENTIAL AND PH,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
For primary bibliographic entry see Field 5B.
W74-06934

THERMODYNAMICS OF ION EXCHANGE,
Technion - Israel Inst. of Tech., Haifa. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-06936

QUALITY OF GROUND WATER IN THE LOWER COLORADO RIVER REGION, ARIZONA, NEVADA, NEW MEXICO, AND UTAH,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 7C.
W74-06960

STREAM TEMPERATURES IN WASHINGTON STATE,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-06962

2L. Estuaries

SOURCES OF OXYGEN IN ESTUARIES,
For primary bibliographic entry see Field 5C.
W74-06539

UTILIZATION OF OXYGEN IN ESTUARIES,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5C.
W74-06540

OXYGEN IN ESTUARIES: REQUIREMENTS FOR FISHERIES,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5C.
W74-06542

A PHYSICAL MODEL FOR PREDICTION AND CONTROL OF SALTWATER INTRUSION IN THE FLORIDAN AQUIFER,
Florida Univ., Gainesville. Dept. of Civil and Coastal Engineering.
For primary bibliographic entry see Field 2F.
W74-06609

SEASONAL CHANGES OF LITTORAL TRANSPORT AND BEACH WIDTH AND RESULTING EFFECT ON PROTECTIVE STRUCTURES,
Maryland Geological Survey, Baltimore.
T. H. Slaughter.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1259-1267, 1973. 17 fig, 4 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Beach erosion, *Sedimentation,

Littoral drift, *Maryland, *Chesapeake Bay, Surveys, Mapping, Data collections, Aerial photography, Terrain analysis, Sedimentary structures, Sand bars, Sand waves.
Identifiers: *ERTS.

The shorelines of Maryland's portion of the Chesapeake Bay exhibit seasonal changes in direction of littoral transport and resulting beach width. Observation and study of this process at selected locations emphasizes the necessity of study for a complete year's seasonal cycle before stating erosion rates of an area to be protected by structures and the cyclical presence or absence of beaches. Seasonal beach conditions at four sites and resulting physical changes to protective structures were analyzed using ERTS-1 multispectral photography. (See also W74-06619) (Knapp-USGS)
W74-06664

RECOGNITION OF BEACH AND NEARSHORE DEPOSITIONAL FEATURES OF CHESAPEAKE BAY,
Maryland Geological Survey, Baltimore.
R. T. Kerhin.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1269-1274, 1973. 5 fig, 4 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Beach erosion, *Sedimentation, Littoral drift, *Maryland, *Chesapeake Bay, Surveys, Mapping, Data collections, Aerial photography, Terrain analysis, Sedimentary structures, Sand bars, Sand waves.
Identifiers: *ERTS.

Beach and nearshore depositional features are being mapped by ERTS to analyze littoral drift and sedimentation patterns in areas of little or no data. Evaluation of beach and nearshore features aids in the selection of small boat harbors, shoreline protective structures, and general coastal zone development. Through ERTS-1 aircraft support imagery, cuspate forelands, welded beach ridges, and recurved spits are mapped. The nearshore depositional features exhibit a bar and trough topography with three distinct types of sedimentary structures: longshore, transverse, and reticulated bars. Synoptic coverage of beach and nearshore depositional features by ERTS-1 data help in determining the general sedimentation patterns, growth of the beach features, and stability of the bar and trough topography. (See also W74-06619) (Knapp-USGS)
W74-06665

APPLICABILITY OF ERTS-1 IMAGERY TO THE STUDY OF SUSPENDED SEDIMENT AND AQUATIC FRONTS,
Delaware Univ., Newark. Coll. of Marine Studies.
V. Klemas, R. Srna, W. Treasure, and M. Otley.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1275-1290, 1973. 18 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Turbidity, *Wetlands, Sea water, Coasts, Suspended load, Sediment transport, Littoral drift, Currents(Water), Saline water intrusion, Estuaries, Saline water-freshwater interfaces, Dye releases, Tracers, Data collections.
Identifiers: *ERTS, *Interfaces(Aquatic), *Delaware Bay.

Imagery from three successful ERTS-1 passes over the Delaware Bay and Atlantic Coastal Region was evaluated to determine visibility of aquatic features. Data gathered from ground truth teams before and during the overflights, in conjunction with aerial photographs taken at various altitudes, were used to interpret the imagery. Visual inspection, density slicing, and multispectral analysis of the imagery revealed strong suspended sediment patterns and several distinct types of aquatic interfaces or frontal systems. ERTS-1 Multispectral scanner band 5 (0.6-0.7 microns) gave the sharpest definition of interfaces between waters of differing turbidity. Band 4 (0.5-0.6 microns), due to its deeper water penetration, was more sensitive to patterns having lower turbidity, yet was veiled by a uniform blanket of atmospheric scattering making identification of sediment patterns more difficult. Band 6 (0.7-0.8 microns) and band 7 (0.8-1.1 microns) clearly delineated the shoreline and discriminated water from land in the marshes. (See also W74-06619) (Knapp-USGS)
W74-06666

CORRELATION OF ERTS MULTISPECTRAL IMAGERY WITH SUSPENDED MATTER AND CHLOROPHYLL IN LOWER CHESAPEAKE BAY,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
D. E. Bowker, P. Fleischer, T. A. Gosink, W. J. Hanna, and J. Ludwick.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1291-1297, 1973. 5 fig, 4 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Suspended load, *Algae, *Chesapeake Bay, Turbidity, Data collections, Water quality, Estuaries, *Chlorophyll, Sedimentary structures, Tides, Currents(Water), Sand waves, Monitoring, *Virginia.
Identifiers: *ERTS, James River(Va).

The feasibility of using ERTS multispectral satellite imagery to monitor the characteristics of estuarine waters is being investigated. Greatest detail in suspended matter is revealed by MSS band 5. Near-surface suspended sediment load and chlorophyll can be observed in bands 6 and 7. Images received partially define extent and location of high suspended sediment concentrations. Turbid water of the James River enters Chesapeake Bay as a plume that can be traced along the southern shore and extends seaward of Cape Henry. An area of highly variable turbidity exists in the lower bay between Hampton and Cape Charles, and may be related to strong tidal currents and large-scale bedforms found here. Net quantity of suspended matter in the lower bay has been decreasing since the inception of the study, and represents the diminution of turbid flood waters carried into the bay in late September, 1972. The results so far point to the utility of MSS imagery in monitoring estuarine water character for the assessment of siltation, productivity, and water types. (See also W74-06619) (Knapp-USGS)
W74-06667

PLUME DEVELOPMENT IN LONG ISLAND SOUND OBSERVED BY REMOTE SENSING (ERTS-1),
Geological Survey, Hartford, Conn.
F. H. Ruggles, Jr.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1299-1303, 1973. 2 fig, 1 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Turbidity, Mixing, Saline water-freshwater interfaces, Data processing, Data collections, Water circulation, *Connecticut, *Sediment transport.
Identifiers: *ERTS, *Long Island Sound.

As the Connecticut River flows into Long Island sound, large plumes are developed during the mixing of ocean and estuarine waters. Plumes were delineated for July 28, October 8, October 27, and December 2, 1972, by analyzing ERTS-1 imagery with the SRI Electronic Satellite Image Analysis Console (ESIAC). Insertion of MSS band 5 into the ESIAC produced the best result in this analysis. The four plumes that have been delineated provide the first input to a time-lapse analysis of circulation patterns at the eastern end of Long Island Sound. (See also W74-06619) (Knapp-USGS)
W74-06668

NEW INSIGHTS INTO THE INFLUENCE OF ICE ON THE COASTAL MARINE ENVIRONMENT OF THE BEAUFORT SEA, ALASKA,
Geological Survey, Menlo Park, Calif. Office of Marine Geology and Hydrology.
For primary bibliographic entry see Field 2C.
W74-06669

ERTS-1 OBSERVATIONS OF SEA SURFACE CIRCULATION AND SEDIMENT TRANSPORT, COOK INLET, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
F. F. Wright, G. D. Sharma, and D. C. Burbank.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentation, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1315-1322, 1973. 3 fig, 4 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Estuaries, *Alaska, Water circulation, Path of pollutants, *Sediment transport, Mixing, Data collections, Glacial drift, Tides, Sedimentation, Erosion, Currents(Water).
Identifiers: *ERTS, *Cook Inlet(Alas).

Cook Inlet is a large tide-dominated estuary in southern Alaska. Highly turbid streams enter the upper inlet, providing an excellent tracer for circulation in the lower inlet. ERTS MSS 4 and 5 images can be used in this area to plot sediment and pollutant trajectories, areas of probable commercial fish concentration, and the circulation regime. (See also W74-06619) (Knapp-USGS)
W74-06670

SEDIMENT DISTRIBUTION AND COASTAL PROCESSES IN COOK INLET, ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
D. M. Anderson, L. W. Gatto, H. L. McKim, and A. Petrone.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1323-1339, 1973. 7 fig, 13 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Estuaries, *Alaska, Water circulation, Path of pollutants, *Sediment transport, Mixing, Data collections, Glacial drift, Tides, Sedimentation, Erosion, Currents(Water).
Identifiers: *ERTS, *Cook Inlet(Alas).

Regional hydrologic and oceanographic relationships in Cook Inlet, Alaska, were recognized from sequential ERTS-1 MSS imagery. Coastline configuration is well defined on bands 6 and 7. Current patterns are visible in the inlet because of differential concentrations of suspended sediment. These patterns are most evident on bands 4 and 5. The circulation patterns are controlled primarily by the interaction between the semidiurnal tides and the counterclockwise Alaska current. Tongues of clear oceanic water enter the inlet through Kennedy Channel along the east shoreline in the vicini-

ty of Cape Elizabeth. A counterclockwise circulation pattern around Kalgin Island results from the interplay of the northerly moving water along the east shore and the southerly moving water along the west side of the inlet. Freshwater plumes heavily laden with sediment are visible at the mouths of all major rivers. Relect plumes from as many as three tidal stages have been recognized. Tidal flats and a number of unmapped cultural features appear prominently in bands 5 and 6. (See also W74-06619) (Knapp-USGS)
W74-06671

DISTRIBUTION AND MOVEMENT OF SUSPENDED SEDIMENT IN THE GULF OF MEXICO OFF THE TEXAS COAST,
Geological Survey, Corpus Christi, Tex.
F. E. Hunter.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1341-1348, 1973. 4 fig, 4 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Turbidity, *Gulf of Mexico, Sediment transport, Suspended load, Provenance, Ocean circulation, Ocean currents, Littoral drift, Data collections, *Texas.
Identifiers: *ERTS.

ERTS-1 imagery is very useful in studies of the distribution of suspended sediment in the Gulf of Mexico off the Texas coast. By using suspended-matter concentrations as tags on water masses, much information on water movement can be obtained. Superimposed on the general offshore decrease in turbidity are more complex concentrations of turbid water which may be classified as plumes or bands. A plume is attached to its source river or inlet during its growth, but at the end of an ebb tidal cycle, the plume from a tidal inlet becomes detached and drifts passively. Most bands are aligned either parallel or obliquely to shore. The bands may originate in several ways: by drift along streamlines from localized sources, such as river mouths, where suspended sediment is being continuously supplied; by the deformation of ebbtide plumes after they have been detached from their source at a tidal inlet; or by the concentration of suspended sediment in the convergence or divergence zones between water masses, especially in the convergence or divergence zones associated with helical circulation cells. (See also W74-06619) (Knapp-USGS)
W74-06672

OCEANOGRAPHIC MAPPING OF STRUCTURE AND DYNAMICS OF THE NORTHERN GULF OF CALIFORNIA BY THE USE OF SPECTRAL MODELING AND ERTS-1,
Arizona Univ., Tucson.
I. K. Leply, G. Calderon, and J. R. Hendrickson.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1349-1356, 1973. 3 fig, 1 tab, 5 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Oceanography, *Ocean currents, Mapping, Surveys, Currents(Water), Data collections.
Identifiers: *ERTS, *Gulf of California.

Distribution and flow of water masses at four depth intervals were determined by analyzing ERTS imagery through the use of optical models of classes of vertical oceanographic profiles. Data used for these models were obtained from shipboard measurements (including surface spectral radiance) and optical and more conventional oceanographic depth profiles. The spectral models obtained were applied to radiance-contoured ERTS imagery in bands 4, 5, 6, and 7. Features mapped by direct photointerpretation of ERTS imagery include submerged shoals, current streamlines, and location of possible upwellings, downwellings and submarine springs. (See also W74-06619) (Knapp-USGS)
W74-06673

REMOTE SENSING OF OCEAN CURRENTS USING ERTS IMAGERY,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
G. A. Maul.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1365-1375, 1973. 4 fig, 10 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Oceanography, *Ocean currents, *Gulf of Mexico, Currents(Water), Ocean circulation, Plankton, Waves(Water), Algae, Turbidity, Data collections, Pollutant identification.
Identifiers: *ERTS.

Major ocean currents such as the Loop Current in the eastern Gulf of Mexico have surface manifestations which can be detected by remote sensing. Surface chlorophyll-a concentrations, which contribute to the shift in color from blue to green in the open sea, have high spatial variability; significantly lower concentrations were observed in the current. The cyclonic edge of the current is an accumulation zone which causes a peak in chlorophyll concentration. The dynamics also cause surface concentrations of algae, which have a high reflectance in the near infrared. Combining these observations gives rise to an edge effect which can show up as a bright lineation on multispectral imagery. Frequently the sea-state in the current is higher than in surrounding water due to differential shear. When high seas introduce bubbles, white caps, and foam, the reflectance is dominated by scattering rather than absorption. This has been detected in ERTS imagery and used for current location. (See also W74-06619) (Knapp-USGS)
W74-06675

APPLICATION OF ERTS-1 IMAGERY TO THE HARVEST MODEL OF THE U.S. MENHADEN FISHERY,
Earth Satellite Corp., Washington, D.C.
P. M. Maughan, A. D. Marmelstein, and O. R. Temple.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1405-1411, 1973. 3 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Fisheries, *Gulf of Mexico, Turbidity, Plankton, Shoals, Data collections.
Identifiers: *ERTS, *Menhaden.

ERTS-1 imagery was evaluated for providing information for the harvest model of the menhaden industry. The unexpected complexity of the physical environment in Mississippi Sound precluded simplistic analysis of fish-environment relationships. Preliminary indications are that an association does exist between fish availability and differences in water transparency (turbidity) within the Sound. A clearer relationship is developing between major turbid features imaged by ERTS-1 and location of successful fishing attempts. Overlays of catch location on ERTS-1 images show an association of school position with interfaces between imaged turbid features. (See also W74-06619) (Knapp-USGS)
W74-06678

COASTAL AND SUBMARINE FEATURES ON MSS IMAGERY OF SOUTHEASTERN MASSACHUSETTS: COMPARISON WITH CONVENTIONAL MAPS,
Geological Survey, Reston, Va. EROS Program Office.
R. S. Williams, Jr.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1413-1422, 1973. 5 fig, 1 tab, 6 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Coasts, *Geomorphology, Topographic mapping, Geologic mapping, Data collections, Data processing, Beaches, Erosion, Sedimentation, *Massachusetts.
Identifiers: *ERTS.

Three ERTS-1, MSS images of southeastern Massachusetts, including Cape Cod Bay, Cape Cod, and Nantucket Sound, show a variety of dynamic geologic and hydrologic phenomena. Coastal features imaged include the coastline at different times in the tidal cycle, harbors, lakes and ponds, marshes (wetlands), and beach and dune areas; submarine features include tidal flats, shoals, natural channels, and bars. Comparisons with conventional maps at 1:1,000,000 and 1:250,000,000 scales show many inaccuracies between the ERTS imagery and the maps. The discrepancies are caused by cartographic generalization from larger scale maps and, in some instances, actual changes in landforms. The marine geological information shown on the ERTS imagery is not shown on the 1:1,000,000- or 1:250,000,000-scale maps, nor is other mappable environmental information. The ERTS-1 imagery provides coastal and submarine information superior to conventional maps at 1:250,000 or smaller scales. The ERTS-1 imagery can be used to increase the accuracy of maps, portray additional environmental information, and provide the capability for frequent updating of maps. (See also W74-06619) (Knapp-USGS)
W74-06679

WATER DEPTH ESTIMATION WITH ERTS-1 IMAGERY,
International Imaging Systems, Mountain View, Calif.
D. S. Ross.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1423-1432, 1973. 5 fig, 5 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Oceanography, *Bathymetry, *Depth, Data collections, Mapping, Surveys, Sounding, Topography.
Identifiers: *ERTS.

Contrast-enhanced 9.5 inch ERTS-1 images were produced for an investigation on ocean water color. Such images lend themselves to water depth estimation by photographic and electronic density contouring. MSS-4 and -5 images of the Great Bahama Bank were density sliced by both methods. Correlation was found between the MSS-4 image and a hydrographic chart at 1:467,000 scale in a number of areas corresponding to water depth of less than 2 meters, 5 to 10 meters, and 10 to about 20 meters. The MSS-5 image was restricted to depths of about 2 meters. Where reflective bottom and clear water are found, ERTS-1 MSS-4 images can be used with density contouring by electronic or photographic methods for estimating depths to 5 meters within about one meter. (See also W74-06619) (Knapp-USGS)

W74-06680

DIGITAL DATA PROCESSING OF ERTS-1 IMAGERY OF DELAWARE BAY,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
A. C. Conrod.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1641-1647, 1973. 3 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Estuaries, Data collections, Digital computers.
Identifiers: *ERTS, *Delaware Bay.

An Earth Resources Data Center is capable of automatically producing classification imagery and thematic maps from ERTS computer compatible tapes. ERTS coverage of Delaware Bay was processed to produce classification imagery of water masses in the bay, and a map of all land-water boundaries along the shoreline including wetlands and inland lakes. The results of processing may be obtained by personnel who are data users, and not data processing specialists. Any ERTS investigator can achieve precise and quantifiable results directly from taped data. (See also W74-06619) (Knapp-USGS)
W74-06703

UNSUPERVISED CLASSIFICATION AND AREAL MEASUREMENT OF LAND AND WATER COASTAL FEATURES ON THE TEXAS COAST,
Lockheed Electronics Co., Inc., Houston, Tex. Aerospace Systems Div.
L. M. Flores, C. A. Reeves, S. B. Hixon, and J. F. Paris.
In: Symposium on Significant Results Obtained from the Earth Resources TechnologySatellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1675-1681, 1973. 4 fig, 1 tab, 7 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, Coasts, Wetlands, Beaches, Forests, *Land use, Data collections, *Texas, Gulf of Mexico.
Identifiers: *ERTS.

ERTS-1 multispectral scanner (MSS) digital data were used to delineate coastal land, vegetative, and water features in two portions of the Texas Coastal Zone. Data were analyzed through the use of two clustering algorithms. Many classes were identified as pure features such as water masses, salt marsh, beaches, pine, hardwoods, and exposed soil or construction materials. Most classes were identified to be mixtures of the pure class types. Using an objective technique for measuring the percentage of wetland along salt marsh boundaries, an analysis was made of the accuracy of areal measurement of salt marshes. Accuracies ranged from 89% to 99%. NASA aircraft photography was used as the basis for determining the true areal size of salt marshes in the study sites. (See also W74-06619) (Knapp-USGS)
W74-06706

USE OF ERTS-1 PICTURES IN COASTAL OCEANOGRAPHY IN BRITISH COLUMBIA,
Department of the Environment, Victoria (British Columbia). Marine Sciences Branch (Pacific Region).
J. F. R. Gower.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1683-1684, 1973.

Descriptors: *Remote sensing, Satellites(Artificial), *Oceanography, Water circulation, *Canada, Data collections, Coasts, Data processing, Path of pollutants, Ocean currents, Turbidity, *Pollutant identification.
Identifiers: *ERTS, *British Columbia.

The ERTS-1 color composite picture of the Vancouver-Victoria region illustrates the value of ERTS data for coastal oceanography. The water of the Fraser River plume which is clearly visible in the center of the scene has been of interest to oceanographers on the west coast of Canada for a long time as an easily visible tracer of surface water circulation in the Strait of Georgia. The ERTS satellite gives the first complete view of the plume area. Electronic enhancement of the images shows that the satellite's narrow angle coverage allows very weak surface turbidity features to be made visible to give information on surface currents over a wide area. (See also W74-06619) (Knapp-USGS)
W74-06707

APPLICATION OF ERTS-1 IMAGERY IN COASTAL STUDIES,
Army Engineer Div. South Pacific, San Francisco, Calif. Coastal Engineering Branch.
O. T. Magoon, D. W. Berg, and R. J. Hallermeier.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1697-1698, 1973.

Descriptors: *Remote sensing, Satellites(Artificial), *Oceanography, Navigation, Sediment transport, Path of pollutants, Coasts, Littoral drift, Sea ice, Ocean currents, Data collections, Data processing, *Pollutant identification, *Turbidity.
Identifiers: *ERTS.

Study of the ERTS image of each spectral band separately, in combination with other bands, and in conjunction with other available data permits extraction of data useful in coastal engineering planning and coastal processes studies. An MSS 5 image of August 16, 1972, clearly defines the configuration of Indian River Inlet, Delaware. The offset between the barrier islands north and south of the inlet gives an indication of predominant south-to-north longshore littoral transport at the inlet. In general, sediment plumes emanating from an inlet may be discernible in MSS 4 or MSS 5 and may give some indication of longshore transport direction at the time of the image. Nearshore flow patterns may be traced using the recorded suspended sediment patterns in ERTS imagery. An ERTS image of Lituya Bay, Alaska, obtained on September 18, 1972, shows a well-defined plume of turbid water associated with the Alsek River. Water flow to the northwest may be inferred from this plume's shape. ERTS imagery of the Laptev Sea coastline on the northern shore of Siberia on September 16, 1972, shows important fluid mixing phenomena. A mosaic of MSS 4 images displays a convoluted interface between waters of markedly different turbidities. A mosaic of MSS 4 images of the mouth of the Colorado River (September 30, 1972) slightly overlaps a mosaic of MSS 4 images of a region slightly further south in the Gulf of California (September 29, 1972). The structure of the complex suspended sediment pattern in the overlap area is quite different on the two days. (See also W74-06619) (Knapp-USGS)
W74-06709

DETECTION OF TURBIDITY DYNAMICS IN TAMPA BAY, FLORIDA USING MULTISPECTRAL IMAGERY FROM ERTS-1,
Geological Survey, Tampa, Fla.
A. E. Coker, A. Higer, and C. R. Goodwin.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1715-1726, 1973. 5 fig.

Descriptors: *Remote sensing, *Data collections, Satellites(Artificial), *Turbidity, Dredging, Harbors, Bays, *Florida, Simulation analysis, Mathematical models, Data processing, Water circulation, Path of pollutants, *Pollutant identification.
Identifiers: *ERTS, *Tampa Bay(Fla).

In order to determine the effects of deepening of Tampa Bay on circulation, water quality, and biota during and after the construction, a digital simulation model of the bay was developed, and data were collected by ERTS and conventional methods. Return-Beam Vidicon (RBV) multispectral data were collected while a shell dredging barge was operating in the bay, and used for turbidity recognition and unique spectral signatures representative of type and amount of material in suspension. The processed data integrated with other modeled parameters provide an overview of the dynamics of turbid material during dredging periods. A three-dimensional concept of the dynamics of the plume was achieved by superimposing the parts of the plume recognized at each RBV band. This provides a background for automatic computer processing of ERTS data and three-dimensional modeling of turbidity plumes. (See also W74-06619) (Knapp-USGS)
W74-06711

NUMERICAL MODEL OF ST. LAWRENCE RIVER ESTUARY,
Institute of Coastal Oceanography and Tides, Birkenhead (England).
D. Prandle, and N. L. Crookshank.
Journal of the Hydraulics Division, American Society of Civil Engineers Vol 100, No HY4, Paper 10472, p 517-529, April 1974. 10 fig, 4 ref, append.

Descriptors: *Estuaries, *St. Lawrence River, *Numerical analysis, *Tides, Bores, *Mathematical models, Rivers, Stratified flow, Saline water intrusion, Water circulation, Coriolis force.

A numerical scheme of tidal propagation involves an explicit fine-difference solution to the shallow-water wave equations. This model was combined with one-dimensional models of the higher reaches of the St. Lawrence and Saguenay Rivers. The resulting model represents a complete simulation of the estuary to the limits of the tidal influence. Computed values of the depth-averaged velocities showed good agreement with field recordings of surface velocities in the upstream section of the lower estuary. However results in the downstream section indicated the magnitude of the computed velocities to be lower than the recorded surface velocities. This inconsistency is related to the degree of the vertical density stratification in the estuary. The influence of the Coriolis force on the flow in the lower estuary was also studied; it has a significant effect at long time-scales. (Knapp-USGS)
W74-06738

THE PRESENT AND FUTURE STATUS OF EASTERN NORTH CAROLINA WETLANDS,
North Carolina Univ., Chapel Hill. Dept. of Geography.
A. J. Hawley.
Available from the National Technical Information Service as PB-231 486, $5.00 in paper copy, $1.45 in microfiche. North Carolina Water Resources Research Institute, Raleigh, UNC-WRRI Report No. 87, January 1974. 169 p. OWRR A-053-NC(1).

Descriptors: *Wetlands, *Coastal marshes, Freshwater marshes, Land tenure, Management, *North Carolina, Coastal plains, *Estuarine environment, *Regulation, Water quality control, Preservation, Drainage, Dredging, Forestry, Fisheries, Wildlife, Recreation.
Identifiers: *Wetlands protection.

Alteration and destruction of North Carolina wetlands are proceeding rapidly. Moreover, State dredge and fill regulations apply only to coastal wetlands and state-owned lakes, whereas estimates indicate that these areas account for less than six percent of all wetlands in eastern North Carolina. Despite its losses North Carolina ranks first among all states on the eastern seaboard in the extent of important estuarine area remaining. The State also leads in the acreage of estuarine habitat preserved or proposed for preservation. North Carolina has 5,885,000 acres of wetlands with 95 percent located in the coastal plain counties. In the late 1950's private individuals, companies and corporations owned all wetland acreages in 27 of these 41 coastal plain counties. Highly conservative estimates indicated that over 72 percent of the coastal marshlands were privately owned whereas 56 percent of inland wetlands were in private ownership. Under the assumption that some wetland areas are worth preserving, this study identifies and maps wetland areas considered important by some 200 knowledgeable field interviewees from four subject-oriented perspectives: (1) forestry, (2) fisheries, (3) wildlife, and (4) recreation. The report concludes with recommendations for a State program for wetland protection. (McJunkin-North Carolina)
W74-06850

THE PROBLEM OF DIRECT GROUNDWATER DISCHARGE TO THE SEAS,
Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem.
For primary bibliographic entry see Field 2F.
W74-06881

WANDO RIVER ENVIRONMENTAL QUALITY STUDIES, AN INTERIM REPORT.
South Carolina Water Resources Commission, Columbia.
For primary bibliographic entry see Field 5B.
W74-06919

DISTRIBUTION OF METALS IN BALTIMORE HARBOR SEDIMENTS,
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
For primary bibliographic entry see Field 5B.
W74-06924

EIGHT YEARS OF OBSERVATIONS ON THE WATER LEVEL AT QUEBEC AND GRONDINES 1962-1969: PART I--ANALYSIS OF THE TIDAL SIGNAL,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
For primary bibliographic entry see Field 2E.
W74-06926

COASTAL WETLANDS IN NEW ENGLAND,
For primary bibliographic entry see Field 5G.
W74-06967

RATIFICATION OF PROPOSED CONVENTION ON THE PREVENTION OF MARINE POLLUTION BY DUMPING OF WASTES AND OTHER MATTER (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of State, Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-06994

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, FLORIDA: PHASE 1 AREA DESCRIPTION,
National Marine Fisheries Service, St. Petersburg Beach, Fla. Gulf Coast Fisheries Center.
J. K. McNulty, W. H. Lindall, Jr., and J. E. Sykes.
Available from the National Technical Information Service as COM-73-50277, $1.45 microfiche. November 1972. 137 p, 86 tab, 60 map, 3 chart, 1 illus, 1 bibl.

Descriptors: *Florida, *Coasts, *Estuaries, *Tidal marshes, *Gulf of Mexico, Mangrove swamps, Fisheries, Shellfish, Pollution, Public health, Water temperature, Salinity, Streamflow, Artificial substrates, Commercial fishing.

Newly-developed tables and maps depict the dimensions, submerged vegetation, tidal marshes, mangrove swamps, commercial oyster beds, leased oyster-rearing areas, sources of pollution, drained tidal marshes, and filled areas of Florida's west coast estuaries. Published and unpublished information on temperature, salinity, geology, artificial fishing reefs, stream discharge, human population, commercial fishing, and economic development is presented in new form. Human population in coastal counties increased from 614,616 persons. in 1930 to 3,320,226 persons in 1970. This increase resulted in adverse effects from pollution to 43% of estuarine areas, in the filling of 23,521 acres mainly for residential and industrial development, and in the draining of 26,676 acres of tidal marshes for mosquito control. The increasing population correlates directly with the number of sources of pollution, filled area, and the area closed to shellfishing by public health authorities. Thus, failure to control the adverse effects of population growth will clearly result in continued rapid degradation of estuarine habitat on Florida's west coast. (Conko-Florida)
W74-06995

DISTRIBUTION AND SEASONAL VARIATIONS OF THE PLANKTON IN 'RIVIERE DE MORLAIX,' (IN FRENCH),
For primary bibliographic entry see Field 5C.
W74-07012

SEASONAL AND STRATIGRAPHIC CONTROLS IN COASTAL FLOODPLAIN SOILS,
Commonwealth Scientific and Industrial Research Organization, Canberra (Australia). Div. of Soils.
For primary bibliographic entry see Field 2G.
W74-07030

FLORIDA MANGROVES AS SHORELINE STABILIZERS,
Florida Dept. of Natural Resources, St. Petersburg. Marine Research Lab.
For primary bibliographic entry see Field 4A.
W74-07047

ECOLOGICAL ASPECTS ALONG THE SHORES OF THE BURABALANGA TIDAL ESTUARY BALASORE DISTRICT, ORISSA STATE,
Botanical Survey of India, Calcutta.
T. A. Rao, and A. K. Mukherjee.
Proc Indian Acad Sci Sect B. Vol 76, No 5, p 201-206. 1972.
Identifiers: Ecological studies, *Estuaries, *India(Burabalanga), Precipitation, Soils, *Tidal estuary.

A few terrestrial strips of the Burabalanga (India) tidal estuary were studied both for their taxa and soil. There is a distinct change in the vegetational patterning and species composition from the stabilized estuarine shore towards the upland relief. With increasing distance from the estuarine shore line, the cover percentage decreased. Similarly, the edaphic parameters show significant differences and show correlation both negative and positive in response to tidal rhythms within a broad topo-sequence. It is concluded that the cause for the sequential changes of taxa and soil correspond roughly to tidal floodings on the intertidal areas and the combined action of precipitation (climate) and local topography on the supratidal area.--Copyright 1973, Biological Abstracts, Inc.
W74-07049

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3B. Water Yield Improvement

SPRINKLER PRECIPITATION GAGE ERRORS,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
For primary bibliographic entry see Field 3F.
W74-06593

CHANGES IN WATER YIELD OF SMALL WATERSHEDS BY AGRICULTURAL PRACTICES,
Agricultural Research Service, Riesel, Tex.
For primary bibliographic entry see Field 2E.
W74-06597

UNIVERSITY OF CHICAGO CONTRIBUTION TO PROJECT METROMEX-I.
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
For primary bibliographic entry see Field 2B.
W74-06937

3C. Use Of Water Of Impaired Quality

EFFECTS OF SEWAGE DISPOSAL AND RECLAMATION ON GROUND WATER QUALITY,
California State Dept. of Public Health, Sacramento. Environmental Sanitation Div.
For primary bibliographic entry see Field 5D.
W74-06948

AGRICULTURAL WASTES AND GROUND WATER QUALITY,
California Univ., Davis.
For primary bibliographic entry see Field 5B.
W74-06951

3D. Conservation In Domestic and Municipal Use

EVAPORATION SUPPRESSION, A BIBLIOGRAPHY.
Office of Water Resources Research, Washington, D.C.
Available from the National Technical Information Service as PB-231 200; $9.75 in paper copy, $1.45 in microfiche. Water Resources Scientific Information Center Report WRSIC 73-216, December 1973, 478 p.

Descriptors: *Evaporation control, *Bibliographies, *Evapotranspiration, Irrigation, *Monomolecular films, Arid lands, Water conservation, *Reservoir evaporation, Water yield improvement, Soil moisture, *Transpiration control.

This report, containing 320 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising SELECTED WATER RESOURCES ABSTRACTS (SWRA). At the

time of search for this bibliography, the data base had 64,268 abstracts covering SWRA through November 1, 1973 (Volume 6, Number 21). Author and subject indexes are included.
W74-06501

3E. Conservation In Industry

COLOR REMOVAL FROM KRAFT MILL EFFLUENTS BY ULTRAFILTRATION,
Champion International Corp., Hamilton, Ohio.
For primary bibliographic entry see Field 5D.
W74-06521

CHLORINE PRODUCTION DROPS AS DEMAND LAGS.
For primary bibliographic entry see Field 5B.
W74-06766

AREA FINANCING OF WATER RESOURCE DEVELOPMENT IN WEST MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 6B.
W74-06846

U.S. DEEPWATER PORT STUDY, VOL. 2. COMMODITY STUDIES AND PROJECTIONS,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
For primary bibliographic entry see Field 6D.
W74-06863

U.S. DEEPWATER PORT STUDY, VOL 3. PHYSICAL COAST AND PORT CHARACTERISTICS, AND SELECTED DEEPWATER PORT ALTERNATIVES,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
For primary bibliographic entry see Field 6D.
W74-06864

EXPLORING ENERGY CHOICES.
Energy Policy Project, Washington, D.C.
For primary bibliographic entry see Field 6D.
W74-06879

3F. Conservation In Agriculture

BAKING QUALITY OF SPRING WHEAT AS AFFECTED BY RAIN DURING DRYING AFTER REAPING (IN POLISH),
Wyzsza Szkola Rolnicza, Wroclaw (Poland). Instytut Hodowli Roslin i Nasiennictwo.
M. Zamorska.
Hodowla Rosl Aklim Nasienn. Vol 16, No 2, p 107-122. 1972. Illus. (English summary).
Identifiers: Drying, Rain, Reaping, *Wheat(Spring), *Poland, *Grain harvesting.

Seven spring wheat varieties were studied over 5 yr. Grain harvested during a rainless spell did not differ significantly from that harvested after with regard to 1000 seed weight, protein content and water-absorbing capacity of flour. Bread and dough characteristics depended to a certain degree on date of harvest, which was related to rainfall. Bread made of grain slightly affected by rain had a greater volume compared to that made of grain harvested during a rainless spell. Bread volume was smaller when grain was subjected to rain for a longer time. Identical or greater dough elasticity and slight softening of dough were characteristic of grain slightly affected by rain compared to that harvested during a rainless spell.--Copyright 1973, Biological Abstracts, Inc.
W74-06548

WHEAT AND GRAIN SORGHUM IRRIGATION IN A WIDE BED-FURROW SYSTEM,
Agricultural Research Service, Bushland, Tex.
R. R. Allen, and J. T. Musick.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 1, p 61-63, January-February, 1972. 4 fig, 1 tab, 7 ref.

Descriptors: *Irrigation practices, *Furrow irrigation *Irrigation design, Irrigation efficiency, Irrigation, Infiltration rates, *Wheat, *Grain sorghum, Agricultural engineering, *Texas.
Identifiers: Row crops, Wide-bed furrows, Southern High Plains.

A wide bed-furrow system was tested for irrigation of winter wheat and grain sorghum on a slowly permeable clay loam in the Southern High Plains. The system consisted of 60-inch spaced furrows separating relatively broad flat beds about 40 inches wide. Wheel traffic zones were maintained along the center of the beds separate from water furrows. The wide bed-furrow system was compared with conventional 40-inch bed-furrows where wheel traffic occurs in irrigation furrows. Beds and furrows were maintained in place during a second crop by no-till seeding grain sorghum after wheat and using chemical weed control. The wide bed-furrow system was successfully managed for production of both winter wheat and grain sorghum. Yields from 60-inch bed-furrows were similar to those from the 40-inch spacing. Water intake during irrigation of wide bed-furrows on the 1,000-foot length of run was similar to 40-inch conventional bed-furrows during a winter irrigation of wheat but averaged 23 percent less during three spring irrigations, and 19 percent less during two seasonal irrigations of grain sorghum. (Skogerboe-Colorado State)
W74-06580

MATHEMATICAL MODEL OF WATER ADVANCE IN BORDER IRRIGATION,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
D. L. Bassett.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 5, p 992-995, September-October, 1972. 3 fig, 12 ref.

Descriptors: *Model studies, *Surface irrigation, *Border irrigation, Irrigation practices, *Mathematical models, Computer models, Infiltration rates, Agricultural engineering, *Unsteady flow.
Identifiers: Water advance.

A mathematical model is presented which describes the advance of water over a dry porous bed as in border irrigation. The model uses the complete equations of continuity and motion for unsteady spatially varied flow. These are solved by the method of characteristics, with an external shape function and volume balance technique for advancing the tip. Computed solutions are compared with laboratory and field tests. Results suggest the model will predict flow with accuracy acceptable for most field use and comparable to that with which input data are described. (Skogerboe-Colorado State)
W74-06582

HYDRAULICS OF A CENTER PIVOT SYSTEM,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
S. T. Chu, and D. L. Moe.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 5, p 894-896, September-October, 1972. 3 fig, 1 tab, 4 ref.

Descriptors: *Fluid mechanics, *Pipe flow, *Head loss, Irrigation practices, Sprinkler irrigation, Hydraulics, Closed conduits, Pressure conduits, Water distribution(Applied), Application methods.
Identifiers: *Center pivot system.

The analytical solutions for the total pressure head loss and the distribution of pressure head loss along the mainline of a center pivot system are presented. It is shown that the theoretical results are good approximations of practical field situations. (Skogerboe-Colorado State)
W74-06583

DESIGN CRITERIA FOR IRRIGATION SYSTEMS WITH COMPLEX PIPE LOOPS,
Nebraska Univ., Lincoln. Coll. of Engineering and Architecture.
D. M. Edwards, and B. Spencer.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 1, p 76-78, January-February, 1972. 3 fig, 1 tab, 7 ref.

Descriptors: *Irrigation engineering, *Irrigation design, *Sprinkler irrigation, *Pipe flow, Pipelines, Hydraulics, Fluid mechanics, Irrigation systems, Irrigation practices, *Design criteria.
Identifiers: *Loop networks.

A design procedure is presented for the analysis of irrigation systems utilizing loop networks. The design of these systems is readily adapted to the digital computer. With the advent of solid set sprinkler, subsurface, and trickle irrigation systems the simple system layout may no longer be an adequate design. In these cases loop networks will lower fixed and operation irrigation costs while developing better water distribution by maintaining more uniform pressures throughout the system. This design procedure has been used successfully in actual field installations. It should be emphasized that although the procedure produces very reliable results, the results of the entire analysis are only as good as the initial selection of inputs and outputs and human judgments. (Skogerboe-Colorado State)
W74-06585

DEVELOPMENT OF ASPHALT MOISTURE BARRIER EQUIPMENT,
International Harvester Co., Hinsdale, Ill.
R. C. Fischer.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 4, p 630-631, July-August, 1972. 2 fig, 6 ref.

Descriptors: *Soil moisture, *Asphalt, *Linings, Soil asphalt, Moisture availability, Deep percolation, Groundwater movement, Root zone.
Identifiers: *Moisture barriers.

Prototype equipment for installation of asphalt water barrier under sandy farmland has attained rates of 1 1/4 acres per hour. Installation requires a tractor of 200 horsepower and 1000 gallons of asphalt per acre. Predictions show that some vegetable crops will return the installation price of $250 per acre within three years. Some corn areas have taken five years. Asphalt barrier will conserve water and plant nutrients from leaching and reduce stream pollution. Asphalt barrier may become a significant factor in increasing the world food supply. (Skogerboe-Colorado State)
W74-06586

EVALUATION OF A FURROW MODIFYING DEVICE,
Agricultural Research Service, Auburn, Ala.
W. R. Gill.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 3, p 401-403, May-June, 1972. 5 fig, 3 tab, 2 ref.

Descriptors: *Soil treatment, *Cultivation, *Soil management, Soil physics, Soil texture, Soil properties, Evaluation, *Furrow irrigation.
Identifiers: *Plowing.

A study of the modification of a furrow slice indicates that a two-phase isolation and shearing of the soil slice may reduce the draft of a plow in cer-

tain soil conditions. The observed effect may be achieved by a reduction of compaction hardening or a partial loosening of the slice. While the undercutting and plowing of the slice may be done in separate operations it would appear that they can be simultaneously undertaken in a single operation if suitable space is provided between the tools. The forces on a plow may be beneficially altered by varying the parameters of an integrally mounted undercutting device. The use of a cutter reduces large lateral forces on plows. (Skogerboe-Colorado State)
W74-06588

DEEP PLOWING - AN ENGINEERING APPRAISAL,
Agricultural Research Service, Beltsville, Md.
P. E. James, and D. E. Wilkins.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 3, p 420-422, May-June, 1972. 5 fig, 4 tab, 4 ref.

Descriptors: *Cultivation, *Soil management, *Deep tillage, Farm management, Root zone, Soil treatment, Radioactivity, *Cost-benefit analysis.
Identifiers: *Deep plowing.

Tests to determine the benefits and costs of deep plowing were conducted under six different sets of conditions. Questions to be answered were: limitations of deep plowing, power requirements, plow modifications needed, and soil burial pattern. Results ranged from almost no benefit to nearly double yields. Answers to the questions are as varied as the field conditions. The need for deep plowing should be evaluated at each location. It is not a solution to all problems. (Skogerboe-Colorado State)
W74-06590

A SIMULATED ENVIRONMENTAL MODEL OF TEMPERATURE, EVAPORATION, RAINFALL, AND SOIL MOISTURE,
Agricultural Research Service, State College, Miss.
J. W. Jones, R. F. Colwick, and E. D. Threadgill.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 5, p 366-372, March-April, 1972. 8 fig, 2 tab, 24 ref.

Descriptors: *Environment, *Computer models, *Plant growth, Plant-Soil-Water relationships, Model studies, *Soil moisture, Climatic data, Precipitation(Atmospheric), Environmental effects, *Simulation analysis, *Crop production, Temperature, Soil moisture.

An environment model was developed for crop production or other biological systems to provide inputs of daily rainfall, temperature, evaporation, and soil moisture variations with depth. The weather model was run on the computer and 10 years of simulated data were shown to compare very closely with observed data for State College. The soil moisture model produced results that fell within 10 percent of the observed data for at least 43 days. The models can be used to provide basic environmental variables for use in crop production simulations for studying complete systems at various locations. The methods of simulation developed show promise for studying and projecting environmental factors. (Skogerboe-Colorado State)
W74-06591

HYDRODYNAMICS OF BORDER IRRIGATION ADVANCE,
Nebraska Univ., Mitchell. Scotts Bluff Experiment Station.
D. C. Kincaid, D. F. Heermann, and E. G. Kruse.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 4, p 674-680, July-August, 1972. 14 fig, 1 tab, 10 ref.

Descriptors: *Irrigation practices, *Irrigation design, *Border irrigation, *Infiltration rates, Irrigation systems, Computer models, Application methods, Crop production, Agricultural engineering, *Mathematical models, Flow, Mannings equation.

A mathematical model simulating border irrigation was developed by numerically solving the hydrodynamic equations of overland flow. A power law infiltration function is used and the resistance is calculated by Manning's equation. The advance rate is controlled by the overall volume balance of the system. The moving boundary is the locus of points at some arbitrary depth. Comparisons of the model with experimental advance data, surface hydrographs and surface storage volume curves show that the model simulates border flow reasonably well with a resistance function of the form of Manning's equation. The model will describe advance for any specified inflow conditions whenever the slope, infiltration and resistance properties of the border are known. (Skogerboe-Colorado State)
W74-06592

SPRINKLER PRECIPITATION GAGE ERRORS,
Agricultural Research Service, Kimberly, Idaho. Snake River Conservation Research Center.
R. A. Kohl.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 2, p 264-265, 271, March-April, 1972. 2 fig, 1 tab, 7 ref.

Descriptors: *Irrigation practices, *Sprinkler irrigation, *Precipitation gages, Uniformity coefficient, *Evaporation control, Evaporation.

Different types of precipitation gages have been tried with sprinkler irrigation. The main problem encountered has been that of evaporation losses from the container. Covering the water with oil had little effect since much of the evaporation took place from droplets clinging to the walls above the oil. A 250 milliliter separatory funnel filled with oil was tested and found to be quite successful. As the water enters, the oil is displaced into another container. The problem of splash losses still exists with this method. (Skogerboe-Colorado State)
W74-06593

SOIL AND WATER LOSSES AS AFFECTED BY TILLAGE PRACTICES,
Agricultural Research Service, Brookings, S. Dak. Soil and Water Conservation Research Div.
C. A. Onstad.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 2, p 287-289, March-April, 1972. 1 fig, 6 tab, 8 ref.

Descriptors: *Soil conservation, *Water conservation, *Erosion control, Soil erosion, Agricultural runoff, *Cultivation, Mulching, Sediment control.

Four corn tillage treatments were compared with respect to their effect on soil and water losses in a 6-year study. The treatments tested were: conventional tillage, mulch tillage, till-planted up and down slope, and till-planted on the contour. Higher runoff on the conventionally tilled plots and lower runoff on the contoured till-plant treatment were significant at the 1-percent level. Runoff differences were not significant for the mulch-tilled and the till-planted up and down slope. The differences in soil loss were also significant in the same manner as runoff. These measurements were made on slope lengths of 72.6 ft. Longer slopes would have more soil loss per unit area. Extrapolated to a 300-foot slope length, the soil loss from the conventional treatment would have exceeded 5 tons per acre even though growing season rainfall was only 80 percent of normal. (Skogerboe-Colorado State)
W74-06595

PERFORMANCE OF A TILE DRAINAGE SYSTEM: AN EVALUATION OF A TILE DESIGN AND MANAGEMENT,
Agricultural Research Service, Urbana, Ill.
E. R. Perrier, A. J. MacKenzie, L. B. Grass, and H. H. Shull.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 3, p 440-444, May-June, 1972. 6 fig, 6 tab, 15 ref.

Descriptors: *Drainage, *Drainage effects, *Drainage practices, Drainage systems, Subsurface drainage, Tiles, Drainage area, Drainage engineering, Irrigation practices, Evaluation, Design.

Comparisons were made of the steady and unsteady-state drainage relations measured in the field to determine the performance and required management of an existing drainage system. The data were obtained from an 80 acre cotton field in California's Imperial Valley. The soil is a Holtville silty clay loam highly stratified, typical of the area. Various drainage design equations were compared to the measured data. Use of the tile lines for irrigation was also investigated. Results indicate that all of the equations only approximate the actual operation of the system. The use of the tile lines for irrigation showed promise. (Skogerboe-Colorado State)
W74-06596

DEEP PLOWING AND CHEMICAL AMENDMENT EFFECT ON A SODIC CLAYPAN SOIL,
Agricultural Research Service, Mandan, N. Dak.
F. M. Sandoval, J. J. Bond, and G. A. Reichman.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 4, p 681-684, 687, July-August, 1972. 4 fig, 5 tab, 13 ref.

Descriptors: *Soil management, *Deep tillage, *Soil amendments, Crop production, Cultivation, Soil properties, Soil chemistry, Soil profiles, Fallowing, Soils.
Identifiers: Deep plowing.

Deep plowing and chemical amendments improved a Solonetzic soil, increased barely yields, and substantially increased wheat yields under the dryland conditions of western North Dakota. The Rhoades silty clay loam, which had a shallow dense sodic claypan, was plowed to 6, 12, and 24-inch depths with and without soil amendments. Split plots were alternately fallowed and cropped for 5 years. Barley was grown 4 years and wheat on the 5th year. Crop yield increases attributed to deep plowing appeared to be associated with greater soil water availability for crop use and for soil leaching. Soil improvement was evidenced by the reduction of bulk densities and lessened saline sodic soil conditions. Hardness of the soil crust was reduced by deep plowing, and amendments further increased soil friability. The 5th year after deep tillage and amendment treatments, spring wheat yields were 1,170, 1,570, and 1,885 pounds per acre for the 6, 12, and 24-inch plowing depths, respectively. (Skogerboe-Colorado State)
W74-06598

A COMPUTERIZED SOLUTION FOR BENCH LEVELING DESIGN,
Archer Daniels Midland Co., Lincoln, Neb.
For primary bibliographic entry see Field 4A.
W74-06600

PASTURE IRRIGATION WITH A CENTER-PIVOT SPRINKLER SYSTEM,
Nebraska Univ., North Platte. Dept. of Agricultural Engineering.
B. R. Somerhalder, and D. C. Clanton.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 5, p 902-904, 908, September-October, 1972. 1 fig, 6 tab.

Descriptors: *Irrigation practices, *Sprinkler irrigation, *Pasture management, Carrying capaci-

ty, Forages, Pasture, Crop production, *Nebraska.
Identifiers: *Center-pivot sprinklers, Beef production.

Irrigated cool season pasture under a 52-acre center-pivot sprinkler system was grazed with beef cattle for two years at the University of Nebraska, North Platte Station. Three classes of animals -- cows and calves, yearlings, and weaned calves -- were grazed at different times during each year. Average investment and operating costs for two years of forage production was $126.04 per acre; average beef gain was 748 lb. per acre. This resulted in a feed cost of 16.8 cents per pound of gain. (Skogerboe-Colorado State)
W74-06601

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION,
California Univ., Riverside. Dept. of Plant Sciences.
For primary bibliographic entry see Field 5D.
W74-06608

APPLICATIONS OF REMOTE SENSING (ERTS) TO RESOURCE MANAGEMENT AND DEVELOPMENT IN SAHELIEN AFRICA (REPUBLIC OF MALI),
American Univ., Washington, D.C. Dept. of Biology.
For primary bibliographic entry see Field 4A.
W74-06686

GAMMA RADIATION MEASUREMENTS OF BULK DENSITY CHANGES IN A SOIL PEDON FOLLOWING IRRIGATION,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W74-06715

BIBLIOGRAPHY OF WATER MANAGEMENT.
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
Dept. of Agricultural and Irrigation Engineering, Utah State Univ., UMC 41, Logan, Utah 84322, Price: $6.00. Utah State University Report 211 (d)-5, January 1974, 352 p. Compiled by: D. Polchow, M. J. Lindberg, and L.C. Gabrish.

Descriptors: *Bibliographies, *Management, *Farm management, Planting management, Land management, *Irrigation, *Agriculture, Soil management, *Water management(Applied), Administration, Water policy, *Foreign projects, Foreign research.

This bibliography is the compilation of all of the relevant book titles dealing with on-farm water located at Utah State University. To date, 9,132 titles are housed in component parts of the Merrill Library which are pertinent to on-farm water. This figure includes: 5,964 books catalogued by dewey decimal call number; 1,593 books housed in the archives and special collections section of the library; 1,593 government documents; 432 vertical file materials; 301 non-book microfilm, microfiche and motion pictures; and 88 maps. Holdings in other centers of information on campus have also been included in the bibliography. There are 1,634 titles in the Utah Water Research Laboratory, 450 titles in the Agricultural and Irrigation Engineering Department, and 193 titles on business law in the College of Business.
W74-06854

EVALUATION OF INFLUENCE OF AVAILABLE SOIL WATER STORAGE CAPACITY ON GROWING SEASON LENGTH AND YIELD OF TROPICAL PASTURES USING SIMPLE WATER BALANCE MODELS,
Commonwealth Scientific and Industrial Research Organization, Townsville (Australia). Div. of Tropical Pastures.
R. L. McCown.
Agric Meteorol. Vol 11, No 1, p 53-63, 1973. Illus.
Identifiers: Dry matter production, *Pastures(Tropical), Season, *Soil water, *Stylosanthes-Humilis, Water storage, Yield, *Water balance models, Simulation analysis.

The results of a comparative study of the soil water balance, plant water relations and dry matter production of pastures (Townsville stylo (Stylosanthes humilis L.)) on 3 soils with available water storage capacities of 75, 150 and 180 mm are reported. Differences among sites in growing season length varied 0-27% in the 4 yr of study. To enable sampling of a much larger number of years, the methods of systems analysis and simulation are used. The experimental data are used to test or to formulate simple models which are in turn used to simulate the growing season length and dry matter production in 60 yr for which rainfall records are available. The results of the simulation study portray the extreme variation in production among years in a seasonally dry tropical climate. While the advantage conferred by a soil storing 180 mm available water as opposed to 75 mm would be expected to be nil in 8 yr, the average increase in pasture yield expected in 70% of years would be 34%.--Copyright 1973, Biological Abstracts, Inc.
W74-06927

WHATEVER HAPPENED TO TVA,
For primary bibliographic entry see Field 6E.
W74-06968

LEGAL AND ADMINISTRATIVE ASPECTS OF AN AQUACULTURE POLICY FOR HAWAII, AN ASSESSMENT,
Hawaii State Dept. of Planning and Economic Development, Honolulu.
For primary bibliographic entry see Field 6E.
W74-06992

USE OF WASTE HEAT FOR SOIL WARMING IN NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering; and North Carolina State Univ., Raleigh. Dept. of Horticultural Science.
For primary bibliographic entry see Field 5D.
W74-07000

PRODUCTION AND BIOGENIC ACTIVITY OF DISTILLATES, FILTRATES AND EXTRACTS FROM THE POMORIE AND ATANASOVO LAGOON MUD, (IN BULGARIAN),
For primary bibliographic entry see Field 2H.
W74-07003

COMPETITIVE SAPROPHYTIC COLONIZATION BY FUSARIUM OXYSPORUM F. SP. VASINFECTUM,
Libya Univ., Tripoli.
M. S. El-Abyad, and Y. E. Saleh.
Trans Br Mycol Soc. Vol 60, No 2, p 187-195, 1973.
Identifiers: Cotton roots, Fusarium-oxysporum-F-Sp-vasinfectum, *Saprophytic colonization, Soils, *Fungus, Hydrogen ion concentration, *Soil moisture.

Saprophytic colonization by F. oxysporum Schl. f. sp. vasinfectum (Atk.) Snyder et Hansen was investigated under several environmental conditions. At low moisture levels (20 and 40% moisture-holding capacity), the fungus invaded and persisted in sterile soil if inoculated before its competitors. At 100% M.H.C. (moisture-holding capacity) the fungus failed to invade the soil, possibly because of antagonism by bacteria. On dead cotton roots the fungus behaved as a vigorous saprophyte at 10-30 C and at pH range 4.7-8.8. Saprophytic colonization of the roots by Fusarium in competition with some common fungi was tested at standard inoculum potentials. The fungus was highly invasive when inoculated simultaneously with or before its competitors but saprophytic colonization was reduced when some competitors were inoculated 2 days ahead.--Copyright 1973, Biological Abstracts, Inc.
W74-07011

NITROGEN-FIXING ACTIVITY IN UPLAND AND FLOODED RICE FIELDS,
For primary bibliographic entry see Field 5B.
W74-07024

ESTIMATES OF PRAIRIE PROVINCIAL WHEAT YIELDS BASED ON PRECIPITATION AND POTENTIAL EVAPOTRANSPIRATION,
Department of Agriculture, Ottawa (Ontario). Plant Research Inst.
G. D. V. Williams.
Can J Plant Sci. Vol 53, No 1, p 17-30. 1973. Illus.
Identifiers: *Canada, Equations, *Evapotranspiration, Prairie, *Precipitation(Atmospheric), Regression analysis, Transpiration, Variability, Weather, *Wheat yields.

Weather-based estimates of Alberta, Saskatchewan and Manitobe (Canada) wheat yields were made for the years 1952-67 by weighting estimates for 42 prairie crop districts according to the number of hectares of wheat per district. The crop-district estimates were computed from May-July monthly precipitation and estimated potential evapotranspiration (PE) data, and the preseason conserved precipitation, using regression equations derived separately for different parts of the prairies. In Saskatchewan, where semiarid climates predominate, variability of wheat yields is high and much of it can be attributed to weather variability. In the most humid province, Manitoba, the yield variation is smallest, and less of this variation can be explained using the weather data. Lack of uniformity in climate, soils, and the sizes of crop districts contributed to several analysis problems, one of which was a bias in the results, particularly in Alberta. Equations based on precipitation and PE were superior to those based on precipitation alone. The estimation procedures can be useful in connection with the transporting and marketing of grain, and in planning future land use.--Copyright 1973, Biological Abstracts, Inc.
W74-07027

CONTROL OF MOSQUITOES BREEDING IN RICE-FIELDS,
Microbiological Research Establishment, Salisbury (England).
For primary bibliographic entry see Field 5G.
W74-07041

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

PROCESSING, CHEMICAL COMPOSITION AND NUTRITIVE VALUE OF AQUATIC WEEDS,
Florida Univ., Gainesville. Water Resources Research Center.
L. O. Bagnall, R. L. Shirley, and J. F. Hentges.

Availability from NTIS as PB-231 207; $3.75 in paper copy, $1.45 in microfiche. Publication No 25, November 16, 1973. 55 p, 29 fig, 12 tab, 30 ref. OWRR A-017-FLA(2). 14-31-0001-3809.

Descriptors: Drying, Chemical analysis, *Nutrients, Digestion, *Aquatic weeds, *Water hyacinth, *Rooted aquatic plants, Animal physiology, Toxins, Feeds, *Forages, Chemical properties, Florida.

As an alternative to chemical control, water hyacinth (Eichhornia crassipes) and hydrilla (Hydrilla verticillata) can be converted to agriculturally useful products. Whole or chopped plants can be readily composted to create an organic material for potting plants. The 90 to 95% moisture content plants can be pressed to remove 75% of the water with a modest energy input. The pressed plants can be ensiled with suitable additives or dried to make animal feed. Projected best processing costs are $2.50 per ton of hyacinth silage, $11.21 per ton of dried hyacinth and $8.40 per ton of dried hydrilla. Protein contents range from 12 to 18% and ash-free crude fiber contents range from 25 to 35%, which are in the range usually found in land forages. Ash concentrations of 10 to 30% were found, which are much higher than those found in land forages. Nitrates, oxalates and cyanide found in the aquatic plants were in ranges considered to be safe in usual land forages. Calcium to phosphorous ratios were at the high end of the satisfactory range and beyond. Dried pelleted water hyacinth has a replacement value equivalent to cotton seed hulls and sugar cane bagasse. Animal acceptability of properly made hyacinth silage was very good. Animal utilization of protein was poor and that of other nutrients was fair for both dried and ensiled water hyacinth. (Morgan-Florida)
W74-06502

APPLICATION OF DDDP IN WATER RESOURCES PLANNING,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 6A.
W74-06503

MATHEMATICAL MODEL OF WATER ADVANCE IN BORDER IRRIGATION,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W74-06582

HYDRAULIC ROUGHNESS OF CORRUGATED PLASTIC TUBING,
Guelph Univ. (Ontario). School of Engineering.
For primary bibliographic entry see Field 8B.
W74-06589

EFFECT OF ROUGHNESS ELEMENTS ON HYDRAULIC RESISTANCE FOR OVERLAND FLOW,
Soil Testing Services, Inc., Northbrook, Ill.
For primary bibliographic entry see Field 8B.
W74-06594

A COMPUTERIZED SOLUTION FOR BENCH LEVELING DESIGN,
Archer Daniels Midland Co., Lincoln, Neb.
E. F. Smith, and D. M. Edwards.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 4, p 667-669, July-August, 1972. 3 fig, 8 ref.

Descriptors: *Computer programs, *Land forming, Land development, Irrigation practices, Agricultural engineering, Land use.
Identifiers: *Land grading.

The analysis presented can be used on all digital computers. Solutions to the program for reshaping the surface of the land resulted in a large savings in cost and time as compared to the trial-and-error procedure without the computer. It also made available the possibility of analyzing the same data with various sets of input restrictions. However, certain limitations are imposed when using this program: (1) Only rectangular areas are adaptable to this program. (2) The entire final surface of the bench is graded to a uniform plane. (3) The digital computer divorces all factors of human judgment from the solution. Human judgment is the key to successful design when applied before data reach the computer. (Skogerboe-Colorado State)
W74-06600

PASTURE IRRIGATION WITH A CENTER-PIVOT SPRINKLER SYSTEM,
Nebraska Univ., North Platte. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W74-06601

COMPARISON OF STRENGTH TEST METHODS FOR CORRUGATED PLASTIC DRAINAGE TUBING,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 8A.
W74-06602

SYMPOSIUM ON SIGNIFICANT RESULTS OBTAINED FROM THE EARTH RESOURCES TECHNOLOGY SATELLITE-1, VOLUME I: TECHNICAL PRESENTATIONS, SECTION B.
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7C.
W74-06619

CHANGE IN LAND USE IN THE PHOENIX (1:250,000) QUADRANGLE, ARIZONA BETWEEN 1970 AND 1972: SUCCESSFUL USE OF A PROPOSED LAND USE CLASSIFICATION SYSTEM,
Geological Survey, Washington, D.C. Geographic Applications Program.
J. L. Place.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 899-906, 1973. 4 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Land use, *Arizona, Urbanization, Grazing, Farms, Planning, Data collections, Data processing, Land classifcation.
Identifiers: *Phoenix(Ariz), *ERTS.

Changes in land use in the Phoenix (1:250,000 scale) Quadrangle in Arizona were mapped using only the images from ERTS-1 to verify the utility of a land use classification system proposed for use with ERTS images. The period of change investigated was from November 1970 to late summary or early fall, 1972. Seasonal changes also were studied using successive ERTS images. Types of changes detected are cropland or rangeland developed for new residential areas; rangeland converted to new cropland; and possibly new ares of industrial or commercial development. The ERTS images focus attention on those areas of greatest change requiring more intensive study. (See also W74-06619) (Knapp-USGS)
W74-06622

LAND USE INVESTIGATIONS IN THE CENTRAL VALLEY AND CENTRAL COASTAL TEST SITES, CALIFORNIA,
California Univ., Santa Barbara. Geography Remote Sensing Unit.
J. E. Estes.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 907-914, 1973. 1 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Surveys, *Land use, Farms, Grazing, Planning, Urbanization, *California, Data collections, Data processing.
Identifiers: *ERTS.

ERTS-1 data can be a valuable source for environmental resource information needs. The resolution of ERTS-1 data places constraints upon the detail to which specific environmental phenomena can be investigated. Furthermore, resolution limitations create certain problems for investigation of environments in which a diversity of phenomena are localized in small areal units. These limitations, however, are mitigated to a large degree through the synoptic perspective afforded by ERTS-1. The advantage of this synoptic view is that large-scale environmental resource information can be obtained within a standardized format for a single date and monitored with comparative ease to reflect changing resource conditions. In the Central Valley and Central Coastal test sites, California, urban areas can be differentiated best on MSS bands 4 and 5; transportation linkages are most readily defined from MSS band 7; agricultural field boundaries are adequately identifiable on MSS bands 4-7, and most clearly defined on band 7; and cultivated land can be mapped accurately from MSS band 5. (See also W74-06619) (Knapp-USGS)
W74-06623

LAND USE IN NORTHERN COACHELLA VALLEY,
California Univ., Riverside. Dept. of Geography.
J. B. Bale, and L. W. Bowden.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 915-922, 1973. 3 fig, 5 ref.

Descriptors: *Remote sensing, Satellites(Artificial), Mapping, *Surveys, *Land use, Farms, Grazing, Planning, Urbanization, *California, Data collections, Data processing.
Identifiers: *ERTS, *Coachella Valley(Calif).

ERTS-1 imagery has great utility for monitoring land use change and as a data source for regional planning. In California, open space desert resources are under severe pressure to serve as a source of recreation for the heavily populated southern coastal plain. The northern half of the Coachella Valley has historically served as a focal point for weekend recreational activity and second homes. Since demand in this area has remained high, land use change from rural to urban residential has been occurring continuously since 1968. This area of rapid change is an ideal site to illustrate the utility of satellite imagery as a data source for planning information. (See also W74-06619) (Knapp-USGS)
W74-06624

LAND USE CLASSIFICATION AND CHANGE ANALYSIS USING ERTS-1 IMAGERY IN CARETS,
Geological Survey, Washington, D.C. Geographic Applications Program.
R. H. Alexander.
In: Symposium on Significant Result Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 923-930, 1973. 7 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Land use, Urbanization, Farms, Forests, Streams, Lakes, Beaches, *Virginia, Data collections, Data processing, Land classification.
Identifiers: *ERTS, *Norfolk(Va).

ERTS imagery in the Central Atlantic Regional Ecological Test Site area was examined to determine what categories of land use could be detected, and to what extent land use change could be identified and mapped. Land use detail exceeds the expectations of the Interagency Steering Committee and the USGS proposed standardized classification. Significant land use changes totaling 39.2 sq km in the Norfolk-Portsmouth SMSA were identified and mapped using a combination of procedures employing ERTS and high-altitude aircraft data. (See also W74-06619) (Knapp-USGS)
W74-06625

ERTS REGIONAL-SCALE OVERVIEW LINKING LAND USE AND ENVIRONMENTAL PROCESSES IN CARETS,
Geological Survey, Washington, D.C. Geographic Applications Program.
R. H. Alexander.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 931-937, 1973. 3 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Land use, Urbanization, Farms, Forests, Streams, Lakes, Beaches, *Virginia, Data collections, Data processing.
Identifiers: *ERTS.

A mosaic of ERTS images of the Central Atlantic Regional Ecological Test Site was used to partition the region into zones on the basis of similarity of tones and textures visible at a regional-scale overview. The resulting patterns were compared with existing small-scale maps of the region representing relief, land surface forms, geology, soils, vegetation, forest types, and land use. The ERTS-derived zones most closely resemble the patterns on the small-scale land use map, suggesting that land use is an indicator or resultant surface expression of several interacting environmental processes. These results lend support to a model of interdisciplinary regional analysis in which data on land use and land use change become the basic data entry into a regional information system to serve regional planners and land managers. (See also W74-06619) (Knapp-USGS)
W74-06626

EVALUATION OF LAND USE MAPPING FROM ERTS IN THE SHORE ZONE OF CARETS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
R. Dolan, and L. Vincent.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 939-948, 1973. 3 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Land use, Urbanization, Farms, Forests, Streams, Lakes, Beaches, *Virginia, Data collections, Data processing.
Identifiers: *ERTS.

ERTS imagery of the Atlantic shoreline zone of the Central Atlantic Regional Ecological Test Site was evaluated for classifying land use and land cover, employing the USGS Geographic Application Programs's land use classification system. ERTS data can provide a basis for land cover and land use mapping within the shoreline zone. Because of the dynamic nature of this environment, two additional terms are considered: vulnerability to storms and progressive erosion, and sensitivity to man's activities. (See also W74-06619) (Knapp-USGS)
W74-06627

GEOGRAPHIC APPLICATIONS OF ERTS-1 DATA TO LANDSCAPE CHANGE,
Tennessee Univ., Knoxville. Dept. of Geography.
J. B. Rehder.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 955-963, 1973. 8 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Urbanization, *Strip mines, Land use, Surveys, Data collections, Data processing, *Tennessee.
Identifiers: *ERTS.

Analysis of landscape change requires large are coverage on a periodic basis in order to analyze aggregate changes over an extended period of time. The ERTS program can provide this capability. Three avenues of experimentation and analysis are being used in the investigation: (1) a multiscale sampling procedure utilizing aircraft imagery for ground truth and control, (2) a densitometric and computer analytical experiment for the analysis of gray tone signatures, comparisons, and ultimately for landscape change detection and monitoring, and (3) an ERTS image enhancement procedure for the detection and analysis of photomorphic regions. The data are being analyzed on the East Tennessee Test Site, a 20,000-square-mile region with landscape change elements such as forest alterations, strip mines, highway construction, urban-suburban growth, and cyclic seasonal changes in agriculture. The Knoxville Test Site, an 11-x 21-mile area which encompasses the city of Knoxville, is being investigated for landscape change associated with urban growth. A second smaller test site on the Cumberland plateau is being monitored for forest alterations and landform disturbances associated with surface strip mining for coal. (See also W74-06619) (Knapp-USGS)
W74-06628

IDENTIFICATION OF SOIL ASSOCIATIONS IN WESTERN SOUTH DAKOTA ON ERTS-1 IMAGERY,
South Dakota State Univ., Brookings. Dept. of Plant Science; and South Dakota State Univ., Brookings. Remote Sensing Inst.
For primary bibliographic entry see Field 2G.
W74-06629

LAND USE OF NORTHERN MEGALOPOLIS,
Dartmouth Coll., Hanover, N. H.
R. B. Simpson, and D. T. Lindgren.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrolton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 973-980, 1973. 4 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Mapping, Surveys, Data collections, Data processing, Urbanization, Farms, Forests, Rural areas, New England, *Cities, Connecticut, Massachusetts, Rhode Island.
Identifiers: *ERTS.

ERTS data were used to map and digitize the land use of northern Megalopolis (Massachusetts, Connecticut, and Rhode Island) and to evaluate ERTS as a planning tool for megalopolitan areas. The southern New England region provides a good test of ERTS's capabilities because of its complex landscape. Not only are there great differences in the degree of urban development, but in relief and vegetative cover as well. Land use classification was applied with relatively good accuracy. Several categories, particularly the nonbuiltup ones, were identified with great accuracy, while the buildup categories have several areas of difficulty. (See also W74-06619) (Knapp-USGS)
W74-06630

REMOTE SENSING APPLIED TO LAND-USE STUDIES IN WYOMING,
Wyoming Univ., Laramie. Dept. of Geology.
R. M. Breckenridge, R. W. Marrs, and D. J. Murphy.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 981-989, 1973. 3 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Wyoming, Strip mines, Urbanization, Farms, Grasslands, Reservoirs, Lakes, Geologic mapping, Data collections, Data processing, Terrain analysis, *Mapping.
Identifiers: *ERTS.

Preliminary evaluations of ERTS-1 show that physiographic and land-use inventory maps can be compiled by using a combination of visual and automated interpretation techniques. Test studies in the Powder River basin of Wyoming show that ERTS image interpretations can provide much physiographic and land-use information needed for management of fuel resources. Water impoundments as small as one acre were detected, and water bodies larger than five acres could be mapped and their acreage estimated. Flood plains, irrigated lands, and some individual crops were identified and mapped. Coniferous and deciduous trees were mapped separately. Gross soil distinctions were made and were found to be closely related to the bedrock geology. Several broad unstable areas were identified. These were related to specific geologic and slope conditions and generally extended through large regions. Some new oil fields and all large open-cut coal mines were mapped. The most difficult task accomplished was that of mapping urban areas. Most Wyoming towns are surrounded by agricultural land, natural flood plains, and rangeland. Areas of new development can usually be defined. Snow cover provides a considerable degree of enhancement of the urban areas by increasing the constrast between the populated areas and the surrounding country. (See also W74-06619) (Knapp-USGS)
W74-06631

ERTS-1 APPLICATIONS TO MINNESOTA LAND USE MAPPING,
Minnesota Univ., Minneapolis. Dept. of Geography.
D. Brown, J. Gamble, S. Prestin, D. Trippler, and M. Meyer.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 991-997, 1973. 8 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Minnesota, Urbanization, Farms, Mining, Forests, Wetlands, Data collections, Data processing, *Mapping.
Identifiers: *ERTS.

Land use class definitions that can be operationally employed with ERTS-1 imagery are being developed for Minnesota. Investigations of urban, extractive, forest, and wetlands areas indicate that it is feasible to subdivide each of these classes into several subclasses with the use of ERTS-1 images from one or more time periods. (See also W74-06619) (Knapp-USGS)

W74-06632

A MULTIDISCIPLINARY SURVEY FOR THE MANAGEMENT OF ALASKAN RESOURCES UTILIZING ERTS IMAGERY,
Alaska Univ., College.
J. M. Miller, and A. E. Belon.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 999-1005, 1973. 5 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Alaska, *Mapping, *Land management, Land use, Forests, Transportation, Mining, Surveys, Data collections, Fisheries, Ecology, Tundra.
Identifiers: *ERTS.

ERTS-1 data were applied to a coordinated multidisciplinary survey of Alaska to provide updated resource inventory data to land use planning groups and government agencies concerned with resource management. Of particular emphasis in this survey are vegetative, hydrological, and geological analyses of the proposed trans-Alaska transportation corridor, and lands to be selected by the State of Alaska, the native corporations, and the Department of Interior. ERTS data are satisfying these objectives on a regional scale. (See also W74-06619) (Knapp-USGS)
W74-06633

THE USE OF ERTS-1 DATA FOR THE INVENTORY OF CRITICAL LAND RESOURCES FOR REGIONAL LAND USE PLANNING,
Wisconsin Univ., Madison.
J. L. Clapp, R. W. Kiefer, M. M. McCarthy, and B. J. Niemann, Jr.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1007-1014, 1973. 6 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Wetlands, *Wisconsin, Surveys, *Land use, Planning, Data collections, Data processsing, Regional analysis.
Identifiers: *ERTS.

In eastern Wisconsin, computer-generated spatial and statistical comparisons of critical land resource data derived from conventional sources, RB-57 photographs, and ERTS images suggest that land resource data can be mapped from ERTS images on a statewide basis. ERTS-interpreted information of wetland resources was more descriptive and accurate than the current statewide information sources. For the detection of the wetland resources as overall patterns, the ERTS images appear comparable to RB-57 photographs as a data source. (See also W74-06619) (Knapp-USGS)
W74-06634

INVESTIGATIONS OF AN URBAN AREA AND ITS LOCALE USING ERTS-1 DATA SUPPORTED BY U-PHOTOGRAPHY,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
H. A. Weeden, F. Y. Borden, D. N. Applegate, and N. Bolling.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellites-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1015-1022, 1973. 4 fig, 1 tab, 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Urbanization, Aerial photography, Mapping, Surveys, Data collections, Data processing, Photogrammetry, Farms, Forests, *Pennsylvania, *Cities.
Identifiers: *ERTS.

An urban area in central Pennsylvania and the surrounding locality were investigated by photointerpretation of ERTS-1 imagery and by computer processing of MSS tapes. The photointerpretation and processing were then coordinated. The results of the cooperative effort of photointerpreters and computer processing analysts were much improved over independent efforts. Single frames of U-2 photography could be projected onto printer output maps with little recognizable distortion in areas 10 to 25 cm square. In this way targets could be identified for use as training areas for computer-processed signature identification. In addition, at any stage of category mapping, the level of success in correct classification could be assessed by this method. (See also W74-06619) (Knapp-USGS)
W74-06635

FIRST LOOK ANALYSES OF FIVE CYCLES OF ERTS-1 IMAGERY OVER COUNTY OF LOS ANGELES: ASSESSMENT OF DATA UTILITY FOR URBAN DEVELOPMENT AND REGIONAL PLANNING,
General Electric Co., Philadelphia, Pa. Missile and Space Div.
S. Raje, R. Economy, and J. McKnight.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1023-1030, 1973. 5 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Cities, *Land use, *Urban mapping, *California, Planning, Data collections, Data processing, Urbanization, Surveys, Regional analysis.
Identifiers: *ERTS, *Los Angeles.

Significant results were obtained from the analyses of ERTS-1 imagery from five cycles over Los Angeles by photointerpretation and by an interactive hybrid multispectral information extraction system. Photointerpretation of ERTS images produced over 25 overlays at 1:1,000,000 scale depicting regional relations and urban structure in terms of several hundred linear and areal features. A possible new fault lineament has been discovered on the northern slope of the Santa Monica mountains. An ERTS scene analyzed to provide object class patterns was directly overlaid on a current Los Angeles County land use pattern map prepared at 1:24,000 scale. The geometric and thematic content is sufficient for routine use at the 1:24,000 standard operating scale for county and regional planning. (See also W74-06619) (Knapp-USGS)
W74-06636

PREPARATION OF URBAN LAND USE INVENTORIES BY MACHINE-PROCESSING OF ERTS MSS DATA,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
W. Todd, P. Mausel, and K. Wenner.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1031-1039, 1973. 3 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Urban mapping, *Land use, *Cities, Data collections, Data processing, Suburban areas, Roads, Forests, Surveys, Mapping.
Identifiers: *ERTS, Milwaukee, Chicago, Indianapolis.

Spectral classes of urban phenomena identified from Earth Resources Technology Satellite (ERTS) multispectral scanner data in Milwaukee included suburban, inner city, industry, grass (open area), road, wooded suburb, water, cloud, and shadow. The Milwaukee spectral class statistics were used to classify the Chicago area, within the same ERTS frame, and similar results were achieved. In another ERTS frame, Marion County (Indianapolis) data were classified into similar classes. The Marion County ERTS study was supported by a land use classification of an area near downtown Indianapolis that utilized 12-band MSS data collected by aircraft from 3,000 feet. The results of the ERTS analyses suggest that satellite data will be useful tool for the urban planner for monitoring urban land use. (See also W74-06619) (Knapp-USGS)
W74-06637

A COMPARISON OF LAND-USE DETERMINATIONS USING DATA FROM ERTS-1 AND HIGH ALTITUDE AIRCRAFT,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
M. A. Lundelius, C. M. Chesnutwood, J. G. Garcia, and R. B. Erb.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1041-1046, 1973. 3 fig, 1 append.

Descriptors: *Remote sensing, Satellites(Artificial), *Urban mapping, *Land use, *Cities, Data collections, Data processing, Suburban areas, Roads, Forests, Surveys, Mapping, *Texas.
Identifiers: *ERTS, *Houston(Tex).

ERTS-1 MSS imagery was used in a study area in the Houston Area Test Site to classify land use. The two types of imagery used included: (1) black and white transparencies of each band enlarged to a scale of approximately 1:250,000 and (2) color transparencies composited from the computer compatible tapes using the film recorder on a multispectral data analysis station. Urban data from the same scene were also analyzed using a computer-aided (clustering) technique. The resulting clusters, representing areas of similar content, were compared with land use patterns in Houston. A technique was developed to correlate the spectral clusters to specific urban features on aircraft imagery by the location of specific, high contrast objects in particular resolution elements. The surface feature composition within each picture element could then be determined from the aircraft imagery. It was concluded that ERTS-1 data could be used to develop Level I and many Level II land use categories for regional inventories and perhaps to some degree on a local level. (See also W74-06619) (Knapp-USGS)
W74-06638

DIGITAL LAND USE MAPPING IN OAKLAND COUNTY, MICHIGAN,
Environmental Research Inst. of Michigan, Ann Arbor.
I. J. Sattinger, and R. D. Dillman.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1047-1054, 1973. 4 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Urban mapping, *Michigan, Recreation, Data collections, Data processing, Rural areas, Wetlands, Streams, Vegetation.
Identifiers: *Detroit, *ERTS.

ERTS-1 data for a portion of Oakland County, Michigan, was computer processed to produce a map of water, urban areas, wooded areas, and other vegetation. Comparison with RB-57 photography of the area shows a good correspondence of the two sources of data. Preliminary evaluation indicates that this type of four-category map derived from ERTS data will be useful for conceptual studies of large geographic areas in recreational planning. (See also W74-06619) (Knapp-USGS)
W74-06639

MAPPING OF AGRICULTURAL LAND USE FROM ERTS-1 DIGITAL DATA,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
A. D. Wilson, G. A. May, and G. W. Peterson.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1055-1058, 1973. 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Farms, *Pennsylvania, Mapping, Surveys, Cities, Urbanization, Forests, Data collections, Data processing.
Identifiers: *ERTS.

A selected area in Lancaster and Lebanon Counties, two of the major agricultural counties in Pennsylvania, was studied using ERTS data. This area was delineated on positive transparencies on MSS data collected on October 11, 1972. Channel seven was used to delineate general land forms, drainage patterns, water and urban areas. Channel five was used to delineate highway networks. These identifiable features were useful aids for locating areas on the computer output. The use of ERTS digital data for the automatic mapping of land use appears very feasible. Forest land, cultivated land and water were classified within a 25,000-acre area. Computer-generated maps were used to delineate broad land use categories, such as forest land, agricultural land, urban areas and water. These digital maps have a scale of approximately 1:24,000, allowing direct comparison with U.S.G.S. 7.5 minute quadrangle sheets. Aircraft data were used as a form of ground truth useful for the delineation of land use patterns. (See also W74-06619) (Knapp-USGS)
W74-06640

THE USE OF THE TEMPORAL DIMENSION IN CLASSIFYING AND MAPPING ERTS-1 MSS DATA,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
F. Y. Borden, and D. N. Applegate.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1059-1066, 1973. 2 fig, 1 tab, 1 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, Cities, Urbanization, Transportation, Streams, Vegetation, Data collections, Data processing, *Pennsylvania, Land classification.
Identifiers: *ERTS.

ERTS-1 MSS data from two scenes of the same central Pennsylvania area were brought into registration by translation and then merged. The two scenes were viewed on different dates but from adjacent ground tracks. Targets selected to be mapped included river water, railroad yards, creeks, urban areas, industrial areas, and vegetation. Equivalent training areas were chosen from each of the original scenes and from the merged data. Classification maps were produced for each, and a comparison was made. Scene brightness was found to have the most important effect on classification differences. (See also W74-06619) (Knapp-USGS)
W74-06641

IDENTIFICATION AND MAPPING OF COAL REFUSE BANKS AND OTHER TARGETS IN THE ANTHRACITE REGION,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
F. Y. Borden, D. N. Thompson, and H. M. Lachowski.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1067-1074, 1973. 2 fig, 1 tab, 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Coal mines, *Mine wastes, *Pennsylvania, Mapping, Surveys, Strip mines, Planning, Data collections, Data processing, Pollutant identification.
Identifiers: *ERTS.

ERTS-1 MSS data covering parts of Pennsylvania's southern and eastern middle anthracite coal fields were studied to determine how well accumulations of coal refuse could be identified and mapped by computer analysis and processing. Spectral signatures of coal refuse targets were similar to water but had higher reflectances in all channels. Although no underflight photography was at hand to judge mapping success, correlation was made with 1:24,000 scale U.S. Geological Survey maps dated 1974 and 1948. Coal refuse targets correlated well with existing maps. (See also W74-06619) (Knapp-USGS)
W74-06642

AUTOMATIC INTERPRETATION OF ERTS DATA FOR FOREST MANAGEMENT,
Honeywell, Inc., St. Paul, Minn. Systems and Research Center.
L. Kirvida, and G. R. Johnson.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1075-1082, 1973. 6 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Surveys, Forests, *Mapping, Forestry, *Forest management, Data collections, *Data processing, Automation.
Identifiers: *ERTS.

Automatic stratification of forested land from ERTS-A data provides a valuable tool for resource management. The results are useful for wood product yield estimates, recreation and wild life management, forest inventory and forest condition monitoring. Automatic procedures based on both multispectral and spatial features are evaluated. With five classes, training and testing on the same samples, classification accuracy of 74% was achieved using the MSS multispectral features. When adding texture computed from 8 x 8 arrays, classification accuracy of 99% was obtained. (See also W74-06619) (Knapp-USGS)
W74-06643

LAND RESOURCES SURVEY FOR THE STATE OF MICHIGAN,
Environmental Research Inst. of Michigan, Ann Arbor.
B. Sellman.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1083-1090, 1973. 4 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, *Land resources, *Michigan, *Land use, Surveys, Data collections, Data processing, Forests, Wetlands, Farms, Cities, Urbanization.
Identifiers: *ERTS.

ERTS-1 satellite imagery was evaluated as an information source for a statewide inventory of Michigan's land resources. The study uses photointerpretation of MSS photography and computed processed results. The first task completed was a 1:500,000-scale land use map of the state in four classes: urban, forest, water, and agriculture and other. This map was constructed from existing information sources including federal, state and county maps, and aerial photography. An ERTS color IR photomosaic for the entire state will also be constructed at a scale of 1:250,000. (See also W74-06619) (Knapp-USGS)
W74-06644

TERRAIN CLASSIFICATION MAPS OF YELLOWSTONE NATIONAL PARK,
Environmental Research Inst. of Michigan, Ann Arbor.
F. J. Thomson, and N. E. G. Roller.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1091-1095, 1973. 2 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Terrain analysis, *Mapping, *National parks, Surveys, Topography, Forests, Grasslands, Vegetation, Data collections, *Land classification.
Identifiers: *ERTS, *Yellowstone National Park.

Preliminary terrain classification maps of Yellowstone National Park were prepared by applying multispectral pattern recognition techniques to ERTS-MSS digital data. The five categories recognized were exposed rock and soil, water, coniferous forest, grass-sage vegetation, and lowland grassy vegetation. (See also W74-06619) (Knapp-USGS)
W74-06645

TERRAIN TYPE RECOGNITION USING ERTS-1 MSS IMAGES,
Itek Corp., Lexington, Mass. Optical Systems Div.
For primary bibliographic entry see Field 7C.
W74-06661

NATURAL RESOURCE INVENTORY AND MONITORING IN OREGON WITH ERTS IMAGERY,
Oregon State Univ., Corvallis.
G. H. Simonson, D. P. Paine, C. E. Poulton, R. D. Lawrence, and J. H. Herzog.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1451-1458, 1973. 6 fig, append.

Descriptors: *Remote sensing, Satellites(Artificial), *Natural resources, *Oregon, *Surveys, Data collections, Data processing, Land use, Forests, Grazing, Vegetation, Forestry, Clear-cutting, Monitoring, Farms, Irrigation.
Identifiers: *ERTS, Cook County(Oregon).

Multidiscipline team interpretation of ERTS and flight imagery provides resource and land use information needed for land use planning in Oregon. A coordinated inventory of geology, soil-land-

scapes, forest and range vegetation, and land use for Crook County illustrates the value of this approach for broad area and state planning. Other applications include mapping fault zones, inventory of forest clearcut areas, location of forest insect damage, and monitoring irrigation development. Computer classification is being developed for use in conjunction with visual interpretation. (See also W74-06619) (Knapp-USGS)
W74-06683

RESOURCE MANAGEMENT IMPLICATIONS OF ERTS-1 DATA TO OHIO,
Ohio Dept. of Economic and Community Development, Columbus.
D. C. Sweet, T. L. Wells, and G. E. Wukelic.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1459-1466, 1973. 5 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Surveys, *Ohio, Strip mines, Air pollution, Monitoring, Data collections, Management, Planning.
Identifiers: *ERTS, *Resource management.

Experimental analysis of ERTS-1 imagery demonstrates that remote sensing from space is a means of delineating and inventorying Ohio's strip-mined areas, detecting powerplant smoke plumes, and providing the data necessary for periodically compiling land use maps for the entire state. The nature and extent of these problems throughout Ohio are summarized. How ERTS data can contribute to their solution and the long-term significance of these initial findings to overall resource management interests in Ohio are discussed. (See also W74-06619) (Knapp-USGS)
W74-06684

ASSESSMENT OF SOUTHERN CALIFORNIA ENVIRONMENT FROM ERTS-1,
California Univ., Riverside. Dept. of Geography.
L. W. Bowden, and J. H. Viellenave.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1467-1474, 1973. 3 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Environment, *California, Data collections, Monitoring, Surveys, Natural resources, Recreation, Vegetation, Urbanization, Land use.
Identifiers: *ERTS.

ERTS-1 imagery is a useful source of data for evaluation of earth resources in Southern California. Applications of ERTS data include detection and identification of macroscale tectonic and vegetational patterns, as well as detailed analysis of urban and agricultural processes. The sequential nature of ERTS-1 imagery allows monitoring significant changes in the environment. Some preliminary work has begun, directed toward assessing the impacts of expanding recreation, agriculture, and urbanization on the fragile desert environment. (See also W74-06619) (Knapp-USGS)
W74-06685

APPLICATIONS OF REMOTE SENSING (ERTS) TO RESOURCE MANAGEMENT AND DEVELOPMENT IN SAHELIEN AFRICA (REPUBLIC OF MALI),
American Univ., Washington, D.C. Dept. of Biology.
N. H. MacLeod.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1475-1481, 1973. 3 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Geologic mapping, Grazing, Farms, Floods, Deserts, Data collections, Dunes, *Arid lands.
Identifiers: *ERTS, *Mali(Sahara region).

The primary resource management problem in Sub-Saharan Africa (the Sahel) is increasing aridity. ERTS observations were made of sand streams, dune orientations, moisture and vegetation changes and other factors. A second major interest is grazing of cattle, sheep, and goats, which is associated with major movements of people and animals twice yearly to obtain forage. The changes in available forage are being observed. The location of the cultivators is also being mapped from ERTS imagery. Hydrological analysis is being carried on in the Niger and Bani River watersheds. The size, timing, and areal extent of the annual flood is of particular interest. So far, good imagery of the maximum flood stage has been obtained and assessed. Geologic information on fault zones, sand dune formations, scarps, tectonic basins and focal points of faulting are all visible. (See also W74-06619) (Knapp-USGS)
W74-06686

FIRST ERTS-1 RESULTS IN SOUTHEASTERN FRANCE: GEOLOGY, SEDIMENTOLOGY, POLLUTION AT SEA,
Institut Francais du Petrole, des Carburants et Lubrifiants, Rueil-Malmaison (France).
A. Fontanel, J. Guillemot, and M. Guy.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1483-1491, 1973. 4 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Geological mapping, Paleohydrology, Sedimentation, Water pollution, Surveys, Mapping, Data collections, Deltas, Structural geology, *Pollutant identification.
Identifiers: *ERTS, *Alps, *France(Rhone Delta).

ERTS photos of Western Alps are very useful for tectonic interpretation because large features are clearly visible on these photographs even though they are often hidden by small complicated structures if studied on large-scale documents. The variations of the shorelines in the Rhone Delta for a period covering the last 8,000 years could be seen. Some instances of industries discharging pollutant products at sea were detected, as well as very large anomalies of unknown origin. Coherent optical processing brings out tectonic features in the Alps. (See also W74-06619) (Knapp-USGS)
W74-06687

ERTS-1 APPLIED FOR STRUCTURAL AND MORPHOLOGICAL INVESTIGATIONS CASE STUDIES: (1) LOS ANGELES, CALIFORNIA AND (2) COASTAL PLAIN, NEW JERSEY,
William Paterson Coll. of New Jersey, Wayne. Dept. of Geography.
For primary bibliographic entry see Field 7C.
W74-06690

A PRELIMINARY EVALUATION OF ERTS-1 IMAGES ON THE VOLCANIC AREAS OF SOUTHERN ITALY (NASA CONTRACT FO-013),
Consiglio Nazionale delle Ricerche, Milan (Italy). Laboratorio per la Geofisica della Litosfera.
For primary bibliographic entry see Field 7C.
W74-06691

THERMAL SURVEILLANCE OF CASCADE RANGE VOLCANOES USING ERTS-1 MULTISPECTRAL SCANNER, AIRCRAFT IMAGING SYSTEMS, AND GROUND-BASED DATA COMMUNICATION PLATFORMS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-06692

INITIAL EVALUATION OF THE GEOLOGIC APPLICATIONS OF ERTS-1 IMAGERY FOR NEW MEXICO,
New Mexico Bureau of Mines and Mineral Resources, Socorro.
Linden K. Vonder, and F. E. Kottlowski.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1561-1566, 1973. 1 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Geologic mapping, *New Mexico, Data collections, Surveys, Mapping, Structural geology, Vegetation, Geomorphology.
Identifiers: *ERTS, Pecos River Valley(N Mex).

Images recorded during the first two months of the ERTS-1 mission in New Mexico are of poor quality, owing largely to high ground reflectance. Later images are of better quality, and MSS bands 5 and 7 have proven to be particularly useful. Features noted include major structural forms, vegetation patterns, drainage patterns, and outcrops of geologic formations. The Border Hills Structural Zone and the Y-O Structural Zone are prominently reflected in coverage of the Pecos Valley. A study of available maps and remote sensing material covering the Deming-Columbus area indicated that the limit of detection and the resolution of MSS products are not as good as those of aerial photographs, geologic maps, and manned-satellite photographs. The limit of detection of high-contrast features on MSS prints is approximately 1,000 feet or 300 meters for linear features and about 18 acres for roughly circular areas. (See also W74-06619)(Knapp-USGS)
W74-06693

MAPPING OF SPOIL BANKS USING ERTS-1 PICTURES,
Ohio Univ., Athens. Dept. of Geology.
For primary bibliographic entry see Field 5A.
W74-06695

USE OF ERTS-1 DATA FOR REGIONAL PLANNING IN THE METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS--A SHORT BRIEF,
Metropolitan Washington Council of Governments, D.C. Remote Sensing Project.
H. J. Mallon.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1613-1624, 1973. 6 fig, 4 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *City planning, *Urbanization, Cities, *District of Columbia, *Land use, Surveys, Mapping, Data collections, Regional analysis.
Identifiers: *ERTS.

Land use and land use activity changes represent basic data requirements in regional planning studies. ERTS remote sensing imagery can provide necessary data. One study using large-scale aircraft imagery developed a high degree of analytical detail and functional identification. ERTS-1 and small-scale aircraft imagery developed data identifying in more general detail major activity changes within the metropolitan region. (See also W74-06619) (Knapp-USGS)

W74-06700

LAND USE MAPPING AND CHANGE DETECTION USING ERTS IMAGERY IN MONTGOMERY COUNTY, ALABAMA,
Alabama Univ., University. Dept. of Civil and Mineral Engineering.
R. P. Wilms.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1625-1633, 1973. 3 fig, 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Urbanization, *Alabama, City planning, Surveys, Mapping, Data collections, Farms, Forests, Suburban areas.
Identifiers: *ERTS, *Montgomery County(Ala).

The feasibility of using remotely sensed data from ERTS-1 for mapping land use and detecting land use change in Montgomery County, Alabama, was investigated. Land use information was gathered from 1964 air photo mosaics and from 1972 ERTS data. The 1964 data provided the basis for comparison with ERTS-1 imagery. From this comparison, urban sprawl was quite evident for the city of Montgomery. A significant trend from forestland to agricultural was also discovered. The development of main traffic arteries between 1964 and 1972 was a vital factor in the development of some of the urban centers. Remotely sensed data from ERTS is useful for inventorying land use and detecting land use change. (See also W74-06619) (Knapp-USGS)
W74-06701

DETERMINATION OF LAND USE IN MINNESOTA BY AUTOMATIC INTERPRETATION OF ERTS MSS DATA,
Honeywell, Inc., St. Paul, Minn. Systems and Research Center.
R. E. Zirkle, and D. R. Pile.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1635-1639, 1973. 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Land use, *Lakes, *Minnesota, Surveys, Data processing, Data collections, Mapping.
Identifiers: *ERTS.

The feasibility of identifying land use in Minnesota by automatic interpretation of ERTS-MSS data was tested. Ultimate objectives include establishment of land use delineation and quantification by computer processing with a minimum of human operator interaction. A lake count in Ramsey County was compared to the ERTS-derived count and a concurrent aerial photo planimetry count. The results were usually within 10% on individual water bodies. (See also W74-06619) (Knapp-USGS)
W74-06702

PRECISION ANNOTATION OF PREDETERMINED PRIMARY SAMPLING UNITS ON ERTS-1 MSS IMAGES,
Earth Satellite Corp., Berkeley, Calif.
J. W. van Roessel, and P. G. Langley.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1661-1673, 1973. 2 fig, 1 tab, 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Mapping, Forests, Forestry, Boundaries(Property), Management, Surveys, Data collections, Terrain analysis, *Forest management.
Identifiers: *ERTS.

Resectioning programs were developed for projecting the boundary corners of sample units, management units, and counties into ERTS-1 and other MSS images. The technique used includes corrections for earth curvature, terrain elevation, and MSS distortions. The minimum standard error obtained was about 0.15 mm or 150 meters on the ground. This technique makes it possible to include land ownership as an integral part of forest resource sampling plans using ERTS imagery. (See also W74-06619) (Knapp-USGS)
W74-06705

UNSUPERVISED CLASSIFICATION AND AREAL MEASUREMENT OF LAND AND WATER COASTAL FEATURES ON THE TEXAS COAST,
Lockheed Electronics Co., Inc., Houston, Tex. Aerospace Systems Div.
For primary bibliographic entry see Field 2L.
W74-06706

APPLICATION OF ERTS-1 IMAGERY IN THE FIELDS OF GEOLOGY, AGRICULTURE, FORESTRY, AND HYDROLOGY TO SELECTED TEST SITES IN IRAN,
Imperial Government of Iran, Tehran. Plan Organization.
K. Ebtehadj.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1699-1714, 1973. 6 plate, 3 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Surveys, *Mapping, Geologic mapping, Forests, Farms, Lakes, Data collections, Data processing.
Identifiers: *ERTS, *Iran.

In a preliminary study of the ERTS-1 imagery coverage of Iran, all of the images were carefully examined, and a photomosaic covering approximately 95% of the country was prepared. A number of images of selected areas were studied in detail. A number of large-scale faults were identified which do not figure on geological maps. A preliminary study was carried out on the recent sediments, their possible sources, and origin. A limited number of geological work maps were prepared. In the fields of agriculture and forestry, studies based on color composite prints of certain areas were undertaken to identify arable areas. Investigations in the field of water resources resulted in the discovery of a number of small lakes and streams. Furthermore, fluctuations of the water level in some lakes were observed. (See also W74-06619) (Knapp-USGS)
W74-06710

ADVANCED SCANNERS AND IMAGING SYSTEMS FOR EARTH OBSERVATIONS.
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W74-06712

BASIC RESEARCH IN THE AQUATIC ENVIRONMENT: EFFECTS OF EUTROPHICATION ON PHYTOPLANKTON POPULATIONS AND SELECTED SPECIES OF AQUATIC VASCULAR PLANTS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 5C.

W74-06835

INTERGOVERNMENTAL RELATIONS AS SEEN BY FLORIDA STATE LEGISLATORS: LAND USE AND WATER RESOURCE PROBLEMS,
Florida Atlantic Univ., Boca Raton.
For primary bibliographic entry see Field 6B.
W74-06845

THE PRESENT AND FUTURE STATUS OF EASTERN NORTH CAROLINA WETLANDS,
North Carolina Univ., Chapel Hill. Dept. of Geography.
For primary bibliographic entry see Field 2L.
W74-06850

STORMWATER RUNOFF QUALITY FOR URBAN AND SEMI-URBAN/RURAL WATERSHEDS,
Purdue Univ., Lafayette, Ind. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W74-06851

TECHNIQUES FOR IDENTIFYING AND EVALUATING MARKET AND NONMARKET BENEFITS AND COSTS OF WATER RESOURCE SYSTEMS.
Texas Water Development Board, Austin. Systems Engineering Div.
For primary bibliographic entry see Field 6B.
W74-06852

DETERMINATION OF THE CONFIDENCE INTERVALS OF THE PEARSON III LAW USING ORDER STATISTICS (DETERMINATION DES INTERVALLES DE CONFIANCE DE LA LOI PEARSON III PAR LES STATISTIQUES D'ORDRE),
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 2E.
W74-06906

ON FLOOD PROBABILITIES OF EAST ALPINE RIVERS,
Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
For primary bibliographic entry see Field 2E.
W74-06909

OHIO RIVER BASIN COMMISSION ANNUAL REPORT, FISCAL YEAR ENDING JUNE 30, 1972.
Ohio River Basin Commission, Cincinnati.
For primary bibliographic entry see Field 6E.
W74-06918

HYDROLOGY AND WATER RESOURCES OF THE HOOSIC RIVER BASIN, MASSACHUSETTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-06958

WATER RESOURCES OF NORTHWESTERN MISSOURI,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7C.
W74-06961

CHOCTAWHATCHEE RIVER AND HOLMES CREEK, FLORIDA, PERMIT APPLICATION BY FLORIDA GAME AND FRESH WATER FISH COMMISSION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.

Available from the National Technical Information Service as EIS-FL-73-0455-F, $5.00 in paper copy, $1.45 in microfiche. June 16, 1972. 56 p, 1 map.

Descriptors: *Florida, *Navigable rivers, *Aquatic habitats, *Environmental effects, Channel improvement, Beds, Water sports, Turbidity, Biota, Ecology.
Identifiers: Navigation obstructions, *Environmental Impact Statement, *Holmes Creek(Fla), *Choctawhatchee River(Fla).

This environmental impact statement involves the application for a permit to remove from the Choctawhatchee River and Holmes Creek snags and stumps that are navigational hazards to small boats. The project would take place on the Choctawhatchee River from the Alabama-Florida State line to the mouth and on Holmes Creek from Vernon to its confluence with the Choctawhatchee. Environmental impacts include increase in opportunity for safe usage of the resource for boating, fishing, and general recreation. Adverse environmental effects include reduction of aquatic habitat, temporary increase in turbidity, and insignificant effect upon biota. (Sears-Florida)
W74-06985

WOODCOCK CREEK LAKE, FRENCH CREEK BASIN, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 8A.
W74-06986

PATTERSON WATERSHED PROJECT, STANISLAUS COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Berkeley, Calif.
Available from the National Technical Information Service as EIS-CA-73-0465-F. $4.25 microfiche $1.45. January 1973. 38 p, 2 map, 1 tab, 3 append.

Descriptors: *Drainage, *Environmental effects, Watersheds, Saline soils, Salts, Waste flows, Crops, *California, Wildlife, Fish.
Identifiers: *Environmental Impact Statements, *Patterson watershed project(Calif), Stanislaus County(Calif).

The watershed protection and agricultural drainage project located in Stanislaus County, California will lower the high water table on 4,190 acres; improve the physical condition of the soil; remove excess soluble salts from the soil; eliminate health hazards due to wet basements and poor septic tank operation; contribute additional dissolved salts to the San Joaquin River and existing drainage ditches; eliminate mosquito-breeding areas; increase crop yields; and create temporary disturbances during construction. The project should not have a significant effect on fish. No project impact on wildlife is anticipated. Small environmental values will be temporarily disturbed while the project is being installed. Some adverse environmental effects include temporary removal of a small land area from production and a possible small increase in waste flows from local food processing plants. (Daniels-Florida)
W74-06987

HURRICANE CREEK WATERSHED PROJECT, HUMPHREYS AND DICKSON COUNTIES, TENNESSEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4D.
W74-06988

LOWER KLAMATH RIVER FLOOD CONTROL PROJECT, DEL NORTE COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATMENT).
Army Engineer District, San Francisco, Calif.
Available from the National Technical Information Service as EIS-CH-73-0494-F. PC $4.50 microfiche $1.45. July 1972. 42 p, 5 plate.

Descriptors: *California, *Flood protection, *Levees, Landfills, Bank protection, Flood plain zoning, Aquatic habitats, Federal budget.
Identifiers: *Environmental Impact Statements, Del Norte County(Calif), *Klamath River(Calif).

This project was authorized under the Flood Control Acts of 1966 and 1970 for the purpose of providing for the flood protection work necessary to preserve the towns and river banks for commercial and recreational opportunities. Flood control for the Lower Klamath River is a three part project which includes filling a depressed area behind a highway, a levee system surrounding a town, and bank protection on the north bank along a two mile reach beginning near the mouth of the river. The flood plain is managed by the county. Environmental impacts include loss of riparian habitat in levee sites and bank protection areas, and preservation of important recreational area through flood plain zoning. Adverse environmental effects include some loss of native vegetation in borrow area and levee sites, temporary loss of riparian habitat in bank protection areas, and temporary turbidity during construction. (Sears-Florida)
W74-06989

NUTWOOD WATERSHED, ILLINOIS (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Washington, D. C.
Available from the National Technical Information Service as EIS-IL-73-0606-F. PC $5.00 microfiche $1.45. March 1973. 52 p, 4 append.

Descriptors: *Illinois, *Watersheds(Basins), *Watershed management, *Land management, Floodwater, Water level, Flood control, Hydrologic aspects, Erosion, Sediment, Drainage, Fishery, Aquatic habitat, Environmental effects, Turbidity.
Identifiers: *Environmental Impact Statements, Jerseyville(Ill), *Nutwood watershed(Ill).

This watershed project is to be carried out in Jersey and Greene Counties, Illinois by three sponsoring local organizations with federal assistance. The project will include land treatment measures supplemented by three floodwater retarding structures, two water level control structures, and one pumping station. Project purposes include improvement of hydrologic conditions, reduction of erosion, sediment, and floodwater damage and improvement of agricultural drainage. The land treatment program will reduce annual upland erosion, promote more efficient land use, and reduce water runoff. Combined land treatment and structural measures will reduce sediment and floodwater damages. Bottomland will benefit from flood control, improved drainage, and more intensive land use. A lake fishery and aquatic habitat will replace pasture land, and woodland and pasture will be periodically inundated by flood detention pools. Construction of the dams and spillways will temporarily disturb or destroy some vegetative cover. (Sears-Florida)
W74-06990

PROPOSAL FOR OKLAWAHA RIVER, OCALA NATIONAL FOREST, FLORIDA, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Forest Service (USDA), Washington, D.C.
Avail from Nat Tech Info Serv, U.S. Dept of Commerce, Springfield, Va as EIS-FL-73-0075-F-2. PC $23.00, microfiche $1.45. Vol 2, Appendices 15-44, January 1973. 419 p, 29 append, 6 map, 20 chart, 91 tab.

Descriptors: *Florida, *Environmental effects, *Reservoirs, *Legislation, *Canals, Biology, Navigation, Locks, Saline water intrusion, Canal seepage, Backwater, Water utilization, Surface water, Habitats, Soil-water-plant relationship, Aquatic environment.
Identifiers: *Environmental Impact Statements, Marion County(Fla), *Oklawaha River(Fla).

This volume contains thirty appendices regarding various studies, reports and projects within the Oklawaha River Proposal. Included are the following: report of fisheries study team, Lake Oklawaha; aquatic vegetation in Lake Oklawaha; recreation use, Rodman Dam; Oklawaha survey; soil properties affected by flooding in Oklawaha River; reproduction survey in Oklawaha River; reports of various organizations on the Cross-Florida Barge Canal; various studies and reports involving aquatic vegetation; and dissolved oxygen levels in Lake Oklawaha. (Conko-Florida)
W74-06993

FLORIDA MANGROVES AS SHORELINE STABILIZERS,
Florida Dept. of Natural Resources, St. Petersburg. Marine Research Lab.
T. Savage.
Fla Dep Nat Resour Mar Res Lab Prof Pap Ser. 19 p 1-46. 1972. Illus.
Identifiers: Avicennia-Germinans, *Florida, *Mangroves(Red and Black), Protection, Rhizophora-Mangle, *Shoreline stabilizers(Plants).

A preliminary assessment of the use of native mangroves for shoreline stabilization and protection is reported. Field and laboratory tests were preformed to select the species and plant procedure best suited for this purpose. Based upon its broad latitudinal range, tolerance of adverse soil conditions, extensive early root system, and ease of transplanting, Avicennia germinans, the black mangrove, holds greatest promise for use in a state-wide program. Furthermore, it is at least as important as Rhizophora mangle, the red mangrove, in natural shoreline protection.--Copyright 1973, Biological Abstracts, Inc.
W74-07047

4B. Groundwater Management

NETWORK ANALYSIS OF CONJUNCTIVELY OPERATED GROUND WATER-SURFACE WATER SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
A. S. Hamdan, and D. D. Meredith.
Available from the National Technical Information Service as PB-231 204; $7.00 in paper copy, $1.45 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 76, January 1974. 75 p, 7 fig, 24 tab, 33 ref, append. OWRR A-059-ILL(2). 14-31-0001-3813.

Descriptors: *Optimum development plans, *Alternative water use, Surface-groundwater relationships, *Conjunctive use, Reservoir operation, *Water supply, Optimization, Operations research, *Illinois, Model studies, Networks, Flow, *Algorithms, Investment, Water policy, Constraints.
Identifiers: *Network flow analysis, Kaskaskia River basin(Ill).

The concept of network models is introduced and a general network model for a multiple purpose, multiple unit water resource system is developed. The 'out-of-kilter' algorithm is then presented as a solution technique for network flow problems. A model for preliminary screening of alternatives for water supply from conjunctive use of ground water and surface water in the Kaskaskia River Basin in Illinois is presented and analyzed. The results from the analysis demonstrate how the network procedures can be used to determine optimum investment plans, to test policy constraints, and to develop policies for future development and future constraints.

W74-06504

CAPILLARY PROPERTIES OF SOILS - INFLUENCE UPON SPECIFIC YIELD,
Agricultural Research Service, Fort Collins, Colo.
For primary bibliographic entry see Field 2F.
W74-06584

APPLICATION OF MONTE CARLO METHOD TO SOIL WATER MOVEMENT,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-06599

A PHYSICAL MODEL FOR PREDICTION AND CONTROL OF SALTWATER INTRUSION IN THE FLORIDAN AQUIFER,
Florida Univ., Gainesville. Dept. of Civil and Coastal Engineering.
For primary bibliographic entry see Field 2F.
W74-06609

HYDROLOGIC DATA FROM THE PICEANCE BASIN, COLORADO.
Geological Survey, Denver, Colo.
Colorado Dept of Natural Resources, Denver, Colorado Water Resources Basic-Data Release No 31, J. F. Ficke, J. B. Weeks and F. A. Welder, Compilers, 1974. 246 p, 80 fig, 91 tab.

Descriptors: *Hydrologic data, *Colorado, *Water wells, *Groundwater basins, *Oil shales, Water levels, Water yield, Drillers logs, Water quality.
Identifiers: *Piceance basin(Colo).

Water data collected in and compiled for the Piceance basin, Colorado, are presented. Included are groundwater and surface-water data collected by the Geological Survey and private companies. Groundwater data were collected from 52 wells in the Piceance basin. Of the 52 wells, 25 wells have transmissivity data, 16 wells have discharge data, 39 wells have temperature data, 8 wells have vertical flow data, 37 wells have specific conductance data, 17 wells have common ion data, and 18 wells have trace element data. A potentiometric map of the report area is given. The map is based on the altitude of water levels in 51 observation wells which penetrate the Green River Formation. The water-level measurements were made during the summer of 1972. (Knapp-USGS)
W74-06714

GROUND-WATER RECHARGE STRIP BASIN-EXPERIMENTS,
California State Univ., Fullerton. Dept. of Civil Engineering.
R. R. Brock, and A. C. Amar.
Journal of the Hydraulics Division, American Society of Civil Engineers Vol 100, No HY4, Paper 10503, p 569-592, April 1974. 12 fig, 2 tab, 15 ref, append.

Descriptors: *Artificial recharge, *Groundwater recharge, *Hydraulic models, *Dupuit-Forchheimer theory, Porous media, Groundwater movement, Unsteady flow.

The problem of recharging a strip basin to a horizontal water table overlying an impervious base was formulated using the saturated flow equations. From this formulation the number of dimensionless variables that determine a dimensionless water table rise were identified using the exact or potential theory and an approximate (Dupuit-Forchheimer) theory. Experiments were performed in a 5-m long sand model. As a dimensionless recharge rate was increased, an expected systematic deviation from the theory is presumably a result of the invalidity of the assumption of the theory for deep flows. Experimental results are presented in the form of dimensionless graphs. (Knapp-USGS)

W74-06740

GEOLOGIC AND HYDROLOGIC BACKGROUND FOR SELECTING SITE OF PILOT-PLANT REPOSITORY FOR RADIOACTIVE WASTE,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W74-06820

241-T-106 TANK LEAK INVESTIGATION.
Atlantic Richfield Hanford Co., Richland, Wash.
For primary bibliographic entry see Field 5B.
W74-06861

GROUND-WATER HYDROLOGY OF NORTHERN NAPA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2F.
W74-06880

EFFECTS OF GROUND-WATER DEVELOPMENT ON THE PROPOSED PALMETTO BEND DAM AND RESERVOIR IN SOUTHEAST TEXAS,
Geological Survey, Austin, Tex.
E. T. Baker, Jr., and C. R. Follett.
Water-Resources Investigations 18-73, June 1973. 70 p, 20 fig, 6 tab, 14 ref.

Descriptors: *Baseline studies, *Groundwater resources, *Pre-impoundment, *Reservoirs, *Texas, Data collections, Hydrogeology, Hydrologic data, Aquifer characteristics, Water wells, Pumping, Water yield, Water level fluctuations, Land subsidence, Water table, Forecasting, Evaluation, Faults(Geologic), Damsites, Surface-groundwater relationships.
Identifiers: *Palmetto Bend Dam(Tex).

Palmetto Bend Dam and Reservoir, a water-supply project to be constructed in two stages, will impound the waters of the Navidad and Lavaca Rivers in Jackson County, Texas. This investigation was made in 1970-1972 to determine the effects of large-scale groundwater withdrawals on the proposed dam and reservoir. Groundwater continues to discharge into the Navidad and Lavaca Rivers by seepage outflow even though large amounts of groundwater are pumped for irrigation. Although a reduction in streamflow probably has occurred, a complete loss of the low flow of the streams by infiltration to a lowered water table seems remote. The large groundwater withdrawals will continue to cause land-surface subsidence, which will range from 0.012 foot to more than 0.026 foot per year. A minimum of about 0.013 to n studying seawater and those based on studying the sea bottom. The seawater methods incorporate investigations of the electric conductivity, the distribution of temperature, the anomalies of salt composition of seawater and groundwater discharge studies with tracers. The sea-bottom methods include locating groundwater discharge from data on physical or chemical anomalies in bottom sediments (geothermal and geochemical techniques) and investigating structural features of the sea bottom (geophysical method, geomorphological method and observations by divers and submersibles). Experience in studying submarine springs and groundwater discharge to the Baltic and Caspian Seas is discussed. (Knapp-USGS)
W74-06920

SOME COMMENTS ON SEAGRASSES AND SEDIMENTARY PROCESSES,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
For primary bibliographic entry see Field 2J.
W74-06922

GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS: PART II--POLLUTION FROM WELLS.
For primary bibliographic entry see Field 5B.
W74-06933

PROCEDINGS NINTH BIENNIAL CONFERENCE ON GROUND WATER.
For primary bibliographic entry see Field 5B.
W74-06942

CONJUNCTIVE OPERATION OF SOUTHERN CALIFORNIA GROUND WATER BASINS WITH THE STATE WATER PROJECT,
Southern California Metropolitan Water District, Los Angeles.
V. Gleason, and D. Georgeson.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 5-37, December 1973.

Descriptors: *Conjunctive use, *California, *Inter-basin transfers, Water resources development, Water management(Applied).
Identifiers: California Water Plan.

Conjunctive operation of Southern California groundwater basins with the State Water Project offers important benefits to Southern California specifically and to the State generally. Those include significant reduction of future State Water Project costs, improvement of the quality of Southern California's water supplies, more efficient use of electric power resources, and more effective use of groundwater basins. Under the storage-in-advance approach the project would use its available delivery capacity to transport surplus Sacramento Valley water to Southern California during wet years and store that water in vacant space within Southern California's groundwater basins for subsequent use during drought years. Under the replacement approach, the project would borrow water that is now in Southern California's groundwater basins when a drought curtails project imports to Southern California. The State or its water service contractors would guarantee the replacement of the borrowed water under terms that would assure full protection for the groundwater basins and their local users. (See also W74-06942) (Knapp-USGS)
W74-06943

GEOTHERMAL DEVELOPMENT AND SOUTHWEST STORAGE BASINS,
Bureau of Reclamation, Boulder City, Nev. Region 3.
R. T. Littleton.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 46-48, December 1973,

Descriptors: *Geothermal studies, *Groundwater basins, *Southwest U.S., California, Water resources development.
Identifiers: *Geothermal energy.

Information about the amount of water stored in debris-filled basins in a large part of the Southwest is reviewed. The total figure is 1.7 billion acre-feet of recoverable storage under present economics and water quality standards. The energy contained in the heated water in some of these basins may be used to desalt the mineralized water and to generate power. (See also W74-06942) (Knapp-USGS)
W74-06945

PROTECTING GROUND WATER QUALITY--SOME PROBLEMS AND SOLUTIONS,
Luhdorff (E.E.) Co., Woodland, Calif.
For primary bibliographic entry see Field 5B.

W74-06946

GROUND WATER QUALITY DATA FOR PLANNING, MONITORING AND SURVEILLANCE,
California State Dept. of Water Resources, Sacramento. Div. of Resources Development.
For primary bibliographic entry see Field 5A.
W74-06947

ENVIRONMENTAL QUALITY: AS AN OBJECTIVE OF GROUND WATER MANAGEMENT,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5B.
W74-06956

AVAILABILITY OF GROUND WATER IN THE GRANTS PASS AREA, JOSEPHINE COUNTY, OREGON,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 7C.
W74-06959

4C. Effects On Water Of Man'S Non-Water Activities

UNRECORDED POLLUTION AND DYNAMICS OF BIOCHEMICAL OXYGEN DEMAND,
Rutgers - The State Univ., New Brunswick, N.J.
For primary bibliographic entry see Field 5B.
W74-06613

MULTIDISCIPLINARY APPLICATION OF ERTS-1 DATA TO NORTH CAROLINA NATURAL RESOURCE MANAGEMENT,
North Carolina State Univ., Raleigh.
C. W. Welby, J. O. Lammi, and R. J. Carson.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1443-1450, 1973. 3 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Data collections, *Management, *Natural resources, Forestry, Urbanization, Sedimentation, *Clear-cutting, Turbidity, *North Carolina.
Identifiers: *ERTS, Natural resource management.

Two examples of the use of ERTS-1 data are monitoring of man's activities affecting the forest resource and pinpointing sources of sediment load in streams and rivers. In North Carolina most forest harvesting is done by the clear-cutting method. Imagery enlarged to a scale of approximately 1:300,000 provides a spectacular display of bare lands and affords a method for rapidly taking inventory of the total clear-cut acreage. Images of two rivers and chains of reservoirs along them provide an opportunity to evaluate ERTS-1 imagery as a tool to monitor sediment sources as well as loads of sediment. Critical areas requiring priority natural resource management action can be identified, and the updating of information about a region is valuable in effective planning and management of the natural resources. (See also W74-06619) (Knapp-USGS)
W74-06682

SENSITIVITY OF SURFACE RUNOFF TO VARIATIONS OF WATERSHED PARAMETERS IN SMALL URBAN AREAS-A KINEMATIC MODEL,
Howard Univ., Washington, D.C. Dept. of Civil Engineering.
C. L. Yen, and S. N. Sakhleh.
Available from the National Technical Information Service as PB-231 484 $4.00 in paper copy, $1.45 in microfiche. Completion Report, C.E. Report 74-02, January 1974, 77 p, 12 fig, 22 ref. OWRR C-3261(3735)(1) 14-31-0001-3735.

Descriptors: *Urban runoff, *Roughness(Hydraulic), *Mathematical models, *Overland flow, Precipitation excess, *Infiltration rates, *Flood peak, *Slopes, Cities, Urbanization, Computer programs, Watersheds(Basins).
Identifiers: *Rainfall duration, Kinematic models.

The continuing growth of urban areas that replace farm lands and forests with paved areas and structures inevitably brings about changes in watershed physical parameters such as surface slope, roughness and infiltration rates. The effects of these changes, which result in increased volume and peak rate of runoff that often cause tremendous damage to life and properties, needs to be better understood. The present study proposed a mathematical model, based on kinematic wave theory, to evaluate the effects of urbanization on peak flows for small areas. This model takes into account the spatial variations of slope, roughness, slope-length, rain-excess intensity and duration. Computer programs for watershed profiles having two and three sections with different parameters were written for computing peak overland flow under various conditions. The effects of varying infiltration rate, slope, roughness, slope-length and rainfall durations have been investigated using the model proposed. Results are: (i) high infiltration (pervious) portion located at the lower end of watershed profile reduces peak flow more effectively than at the upper end, (ii) increasing roughness-slope parameter beyond certain value will bring about little additional reduction in peak flow, and (iii) for a given rainfall duration, an optimum slope-length for managing peak flow can be found. These results need to be verified by laboratory or field observations.
W74-06853

EXPLORING ENERGY CHOICES.
Energy Policy Project, Washington, D.C.
For primary bibliographic entry see Field 6D.
W74-06879

UNIVERSITY OF CHICAGO CONTRIBUTION TO PROJECT METROMEX-I.
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
For primary bibliographic entry see Field 2B.
W74-06937

RIVER V. RICHMOND METROPOLITAN AUTHORITY.
For primary bibliographic entry see Field 6E.
W74-06984

4D. Watershed Protection

RESERVOIR SEDIMENTATION,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 2J.
W74-06883

AN EXPANDING ROLE FOR SUBARCTIC WATERSHED RESEARCH,
Cold Regions Research and Engineering Lab., Fairbanks, Alaska.
C. W. Slaughter, and A. E. Helmers.
Water Resources Bulletin, Vol 10, No 2, p 256-264, April 1974. 3 fig, 21 ref.

Descriptors: *Water resources, *Research and development, *Environment, *Arctic, Water balance, Hydrologic budget, Soils, Cold regions, Ecology, Climatology, Permafrost, Hydrology, Hydrogeology, Water yield, Data collections, Forestry, Land management.

Natural resources research should in many cases be broadened in scope and oriented toward more general environmental problems. Locales with a history of watershed research are suited for development of comprehensive, environmental research programs. In the North American Subarctic there is almost no history of watershed studies. Basic data on hydrometeorologic parameters such as precipitation amounts and areal and seasonal distribution of runoff are scarce; the data framework within which environmental understanding can be structured is exceedingly sketchy. Opportunity exists in the discontinuous-permafrost settings of central Alaska to begin rectifying this situation. A basic program of multiagency, multidiscipline research and data acquisition for the most significant hydrologic subregions is being research and data acquisition for the most significant hydrologic subregions is being developed, based around several existing environmental research areas, chiefly the Bonanaza Creek Experimental Forest, the Caribou-Poker Creeks Research Watershed, the Wickersham Dome Fire Study Area, and a series of outlying sites. (Knapp-USGS)
W74-06884

CONSERVATIONISTS GO TO COURT--PART 1,
R. D. Butcher.
American Forests, Vol 77, p 32-35, 55, June 1971. 2 photo.

Descriptors: *Federal Government, *Rivers and Harbors Acts, *Aesthetics, *Judicial decisions, Social aspects, Wildlife conservation, Cases, Public rights, Permits, Regulation, Wetlands, Political aspects, Governments, Dredging, Landfills.
Identifiers: *Administrative regulations, *Environmental impact statement, *National Environmental Policy Act, *Standing(Legal), Public trust doctrine, Sierra Club.

The judicial system is finally helping to resolve a wide range of natural resource conservation controversies. The subjects of litigation are almost limitless, with the common denominator being the public's right to a quality environment. Ways are being found to knock down the old barriers to bringing such suits, such as the problem of standing to sue. In Scenic Hudson Preservation Conference v. Federal Power Commission, it was held that those who by their activities and conduct exhibited special interest in esthetic, conservational, and recreational aspects of power development were aggrieved parties. Standing has been found under the public trust doctrine in Gould v. Greylock Reservation Commission. In Sierra Club v. Hickel standing was denied on the grounds that no local conservation group was joined. However the Sierra Club is made up of local chapters and this case is being appealed. Many lawsuits concern the dredging and filling of tidal wetlands under the authority of the U.S. Army Corps of Engineers pursuant to the Rivers and Harbors Act of 1899. It has been held that permits may be withheld on environmental grounds in compliance with the National Environmental Policy Act. (Sperling-Florida)
W74-06971

PATTERSON WATERSHED PROJECT, STANISLAUS COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Berkeley, Calif.
For primary bibliographic entry see Field 4A.
W74-06987

HURRICANE CREEK WATERSHED PROJECT, HUMPHREYS AND DICKSON COUNTIES, TENNESSEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.

Avail from Nat Tech Info Serv, as EIS-TW-73-1466-F. PC $4.75 microfiche $1.45. August, 1973. 49 p, 1 map.

Descriptors: *Watershed management, *Erosion control, *Watershed Protection and Flood Prevention Act, *Soil management, Flood control, Flood protection, Floodwater, *Tennessee, Adoption of practices, Water supply, Water resources development, River basin development, Agricultural watersheds, Structures.
Identifiers: *Environmental Impact Statements, Humphreys and Dickson Counties(Tenn), *Hurricane Creek Watershed(Tenn).

The project's purposes are watershed protection and prevention of floods and municipal water shortage. The project includes conservation land treatment measures to be supplemented by seven floodwater retarding structures and one multiple-purpose structure. The project will be funded by federal assistance under the authority of the Watershed Protection and Flood Prevention Act and will be implemented by the sponsoring local organizations. The proposed conservation land treatment measures should reduce erosion and sediment production by 29%. The structural measures should reduce floodwater crop and pasture damage on 4,820 acres of flood plain by 78%, sediment and flood plain scour damage by the same percentage and damages to roads and bridges by 93%. There should also be a reduction in in conveniences such as closed roads. About 755 acres of vegetation cover will be affected, including 163 acres of upland wildlife habitat that will be lost, and another 700 acres will be subject to certain land use changes. Alternatives considered included conservation land treatment alone, the purchasing of flood plain land for public use, combinations of 19 potential floodwater retarding structure sites with and without channel work, seeking alternate water sources, and maintaining the status quo. (Sutton-Florida)
W74-06988

NUTWOOD WATERSHED, ILLINOIS (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Washington, D. C.
For primary bibliographic entry see Field 4A.
W74-06990

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

FRESHWATER BIOLOGY AND POLLUTION ECOLOGY: TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
Available from the National Technical Information Service as PB-224 201, $10.00 in paper copy, $1.45 in microfiche. Report No EPA-430/1-73-006, April 1973. 550 p, 220 fig, 37 tab, 754 ref.

Descriptors: *Training, *Aquatic environment, *Aquatic life, *Water pollution control, *Ecology, Waste water treatment, Systematics, Water quality, Education, Water pollution effects, Bioassay, Limiting factors, Analytical techniques, Aquatic animals, Aquatic plants, Legal aspects, Biodegradation, Indicators, Self-purification, Water temperature, Oil pollution.

This manual is designed as an introduction to aquatic biology for sanitary engineers, scientists, and others who are involved in freshwater pollution studies, surveillance, and control, and will have its greatest value as an adjunct to classroom presentations. Successful development and maintenance of an aquatic population or community depend upon a harmonious ecological balance between environmental conditions and tolerance of the organisms to variations in one or more of these conditions. The principle of limiting factors is one of the major aspects of the environmental control of aquatic organisms. Nomenclature is discussed in detail and aquatic plants and animals classified. The significance of fungi in the biodegradation of organic matter and bacteriological indicators of water pollution are described. The effects of organic pollution such as sewage or other readily oxidizable organic wastes are presented. This manual is primarily concerned with sublethal or chronic levels of pollutants. Recommendations are made for the protection of aquatic life resources and include courtroom procedure and case preparation. Effects of pollution on aquatic life include toxic and organic wastes which may be reinforced or neutralized by a complex of industrial wastes. (Jones-Wisconsin)
W74-06558

GEOGRAPHIC APPLICATIONS OF ERTS-1 DATA TO LANDSCAPE CHANGE,
Tennessee Univ., Knoxville. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W74-06628

IDENTIFICATION AND MAPPING OF COAL REFUSE BANKS AND OTHER TARGETS IN THE ANTHRACITE REGION,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
For primary bibliographic entry see Field 4A.
W74-06642

DETERMINATION OF AEROSOL CONTENT IN THE ATMOSPHERE,
Science Applications, Inc., La Jolla, Calif.
For primary bibliographic entry see Field 7C.
W74-06647

CORRELATION OF ERTS MULTISPECTRAL IMAGERY WITH SUSPENDED MATTER AND CHLOROPHYLL IN LOWER CHESAPEAKE BAY,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 2L.
W74-06667

ERTS-1 OBSERVATIONS OF SEA SURFACE CIRCULATION AND SEDIMENT TRANSPORT, COOK INLET, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W74-06670

SEDIMENT DISTRIBUTION AND COASTAL PROCESSES IN COOK INLET, ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2L.
W74-06671

OCEANOGRAPHIC FEATURES IN THE LEE OF THE WINDWARD AND LEEWARD ISLANDS: ERTS AND SHIP DATA,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 2E.
W74-06674

REMOTE SENSING OF OCEAN CURRENTS USING ERTS IMAGERY,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 2L.
W74-06675

BIOMASS IN THE UPWELLING AREAS ALONG THE NORTHWEST COAST OF AFRICA AS VIEWED WITH ERTS-1,
Delaware Univ., Newark.
K-H. Szekielda, and R. J. Curran.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1385-1401, 1973. 10 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Productivity, Oceanography, *Plankton, Ocean currents, Primary productivity, Data collections, Atlantic Ocean, *Pollutant identification.
Identifiers: *ERTS, *Upwelling(Oceans), Africa.

ERTS imagery was studied as a means of acquiring data on marine productivity. Light penetration in water is affected by plankton, algae, and dissolved and suspended matter. As a consequence, the composition of backscattered light from below the air-sea interface is determined by the nature of the constituents in the water column. In contrast to the absorption spectrum of chemically pure chlorophyll in solution, algae suspensions absorb and scatter light more uniformly throughout the visible part of the electromagnetic spectrum. Because of their spectral absorption and scattering properties, plankton concentration can be estimated by measuring the spectral backscattered radiance over water. Experiments using this approach were performed in upwelling regions along the northwest coast of Africa. Recordings parallel to the coast showed periodic variations in the chlorophyll concentration with the same spacing as the periodicity observed with ERTS-1 data. (See also W74-06619) (Knapp-USGS)
W74-06677

FIRST ERTS-1 RESULTS IN SOUTHEASTERN FRANCE: GEOLOGY, SEDIMENTOLOGY, POLLUTION AT SEA,
Institut Francais du Petrole, des Carburants et Lubrifiants, Rueil-Malmaison (France).
For primary bibliographic entry see Field 4A.
W74-06687

MAPPING OF SPOIL BANKS USING ERTS-1 PICTURES,
Ohio Univ., Athens. Dept. of Geology.
M. U. Ahmad, D. A. Kantner, and J. W. Antalovich.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1575-1582, 1973. 7 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Strip mining, *Ohio, Surveys, Mapping, Data collections, Vegetation, Soils, Hydrology, Pollutant identification.
Identifiers: *ERTS.

NASA's Earth Resources Technology Satellite (ERTS-1) is sending good quality pictures. Four pictures of different wave lengths (MSS 4, 5, 6, 7) were used in a study of two strip-mine areas in southeastern Ohio. The first area is near Piedmont Lake and the second area is near New Lexington. For the New Lexington area, color infrared pictures taken at an elevation of 18,000 feet were also used for correlation with the ERTS-1 imagery. MSS 5 and 7 are most useful in defining the stripped land and show that the hydrological and soil characteristics are remarkably different from those of the surrounding lands. (See also W74-06619) (Knapp-USGS)
W74-06695

AIR QUALITY INDICES FROM ERTS-1 MSS INFORMATION, PR 568,
MITRE Corp., McLean, Va.
E. L. Riley, S. Stryker, and E. A. Ward.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1583-1591, 1973. 3 fig, 1 tab, 5 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Turbidity, *Air pollution, Monitoring, Surveys, Data collections, Smog, Pollutant identification.
Identifiers: *ERTS, Air quality.

Comparison between ground-based atmospheric turbidity network measurements and the average scene grayness from ERTS MSS channel 4 data is in progress. Correlation between these two sources is promising. If continued correlation occurs for other ERTS-1 overflight dates and ground test sites, ERTS-1 will be useful for air quality studies and monitoring. (See also W74-06619) (Knapp-USGS)
W74-06696

UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES,
Bendix Corp., Ann Arbor, Mich.
P. E. Chase, L. Reed, and V. E. Smith.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1597-1604, 1973. 3 fig, 1 tab, 5 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Lakes, *Eutrophication, *Limnology, Surveys, Mapping, Data collections, Wetlands, *Michigan, Pollutant identification.
Identifiers: *ERTS.

ERTS imagery was tested for use in estimating and monitoring trophic levels of inland lakes. Preliminary findings are that Michigan lakes and ponds of one acre or more are resolvable in bands 5, 6 and 7 of MSS imagery under fair conditions (haze and 70% cloud cover). In processed imagery, smaller features, including water color patterns, are evident within some lakes of 40 acres or more. Image distortion is minimal; discrimination of lakes and ponds from various wetlands is good. Subsequent ERTS and aircraft imagery will be correlated with detailed ground truth of water color and quality in eutrophic test lakes. (See also W74-06619) (Knapp-USGS)
W74-06698

ERTS-1 OBSERVES ALGAL BLOOM IN LAKE ERIE AND UTAH LAKE,
National Environmental Satellite Service, Washington, D.C.
A. E. Strong.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1605-1612, 1973. 5 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Eutrophication, *Lake Erie, Algae, Water circulation, Data collections, Currents(Water), Lakes, Limnology.
Identifiers: *ERTS, *Utah Lake.

During late summer when the surface waters of Lake Erie reach their maximum temperature, an algal bloom is likely to develop. Such phenomena have been noticed on other shallow lakes using ERTS-1 and characterize eutrophic conditions. The concentration of the algae into long streamers provides additional information on surface circulations. To augment the ERTS-1 MSS data of Lake Erie, an aircraft was flown to provide correlative thermal-IR and additional multiband photographs. The algal bloom is highly absorptive in the visible wavelengths but reverses contrast with the surrounding water in the near-IR bands. The absorption of shortwave energy heats the dark brown algal mass, providing a hot surface target for the thermal-IR scanner. (See also W74-06619) (Knapp-USGS)
W74-06699

USE OF ERTS-1 PICTURES IN COASTAL OCEANOGRAPHY IN BRITISH COLUMBIA,
Department of the Environment, Victoria (British Columbia). Marine Sciences Branch (Pacific Region).
For primary bibliographic entry see Field 2L.
W74-06707

APPLICATION OF ERTS-1 IMAGERY IN COASTAL STUDIES,
Army Engineer Div. South Pacific, San Francisco, Calif. Coastal Engineering Branch.
For primary bibliographic entry see Field 2L.
W74-06709

DETECTION OF TURBIDITY DYNAMICS IN TAMPA BAY, FLORIDA USING MULTISPECTRAL IMAGERY FROM ERTS-1,
Geological Survey, Tampa, Fla.
For primary bibliographic entry see Field 2L.
W74-06711

EFFECTS OF OIL DISPERSANTS AND OIL EMULSIONS ON MARINE ANIMALS,
Kristinebergs Zoologiska Station, Fiskebackskil (Sweden).
For primary bibliographic entry see Field 5C.
W74-06745

CHEMICAL ASPECTS OF BIOASSAY TECHNIQUES FOR ESTABLISHING WATER QUALITY CRITERIA,
Texas A and M Univ., College Station. Dept. of Civil Engineering.
G. F. Lee.
Water Research, Vol 7, No 11, p 1525-1546, November 1973. 47 ref.

Descriptors: *Water quality standards, *Bioassay, *Methodology, *Reviews, Chemicals, Oxidation, Solubility, Solid wastes, Salt balance, Organic matter, Toxicity, Pesticides, Chelation, Trace elements, Hardness(Water), *Chemical analysis, Chemical properties, Oxidation-reduction potential, Biochemistry, Fish, Iron, Nitrilotriacetic acid, Detergents, Cadmium, Sorption, Hydrogen ion concentration, Acids, Polychlorinated biphenyls, Piscicides, Water quality standards.
Identifiers: Complexation, Ionic strength, Salt ratios, Toxaphene, EDTA, Errors, Error sources, Method validation.

Increasing emphasis is being placed on the use of bioassay techniques to evaluate potential water quality problems in the aquatic environment. Although the physical environment is carefully maintained, often less emphasis is placed on maintaining the proper chemical environment in bioassay tests. Considerations of oxidation state, solubility, complexation, ionic strength, type and amount of solids, salt ratios and concentrations and organic content are essential in extrapolating the results from the test conditions to the environment. The chemical history of the test organism must be controlled to insure meaningful results, and analytical measurements should be made to insure that the proper chemical species is maintained throughout the test period. If the environmental conditions are not duplicated, studies are needed to determine how the results are dependent on the test environment used. Examples in which changes in the chemical environment of a bioassay test may affect the results of the test are discussed and procedures for minimizing problems of this type are recommended. (Mortland-Battelle)
W74-06747

CULTURE STUDIES OF ENTEROMORPHA LINZA (L.) J.AG. AND ULVARIA OXYSPERMA (KUTZING) BLIDING (CHLOROPHYCEAE, ULVALES) FROM CENTRAL AMERICA,
North Carolina Univ., Wilmington. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-06749

YAMADAPHYCUS, A NEW GENUS OF THE DELESSERIACEAE (RHODOPHYTA),
Hokkaido Univ., Sapporo (Japan).
H. Mikami.
Phycologia, Vol 12, Nos 3/4, p 139-143, December 1973. 16 fig, 16 ref.

Descriptors: *Rhodophyta, *Marine algae, *Speciation, *Systematics, Marine plants, Plant morphology, Reproduction, Plant physiology, Plant groupings.
Identifiers: *Yamadaphycus carnosus, *Japan, Delesseria.

The structure and reproduction of Yamadaphycus carnosus gen. et sp. nov. from the southeastern coast of Hokkaido, Japan, are described, and the taxon's relationship to other members of Delesseriaceae is discussed. The structure of the apex belongs to Kylin's Delesseria type. The female and asexual reproductive organs occur on special proliferations that are formed in clusters and at random on both surfaces of the fronds. (Holoman-Battelle)
W74-06753

PHOSPHORIMETRIC DETERMINATION OF TRACES OF BORON,
Geneva Univ. (Switzerland). Dept. of Inorganic and Analytical Chemistry.
M. Marcantonatos, G. Gamba, and D. Monnier.
Analytica Chimica Acta, Vol 67, No 1, p 220-224, November 1973. 3 fig, 2 tab, 5 ref.

Descriptors: *Water analysis, *Sea water, *Boron, Chemical analysis.
Identifiers: *Phosphorimetry, Detection limits, Sample preparation, Chemical interference, Calibration curves.

Micro-amounts of boron in seawater and in solutions containing an interfering metal can be determined using the phosphorescent emissions which occur with the complexation of boric acid by dibenzoylmethane or benzoylacetone. Calibration curves were constructed using standard solutions prepared by heating nanogram quantities of boron as boric acid in sulfuric acid, cooling, and adding ether. Limits of detection were about 0.4 ng B/ml with dibenzoylmethane when emission was measured at 508 nm with a 2-mm dia. phosphorimetric cell and an excitation wavelength of 402 nm. The presence of Cr, Ce, Ni, Cu, Mg, Mn, Pb, Cd, Zn, Sn, Li, Na, K, Al, V, Fe, Co, Ag, Te, Hg, In, Tl, NH4, F, Br, Cl, I, NO3, SCN, PO4, S2O3, and CH3COO ions gave errors of less than 10 percent. Mo and W caused significant interference. Seawater samples were prepared for analysis according to the same procedure used for standard solutions substituting seawater for boric acid. The solutions for analysis should contain no more than 3 percent seawater. (Little-Battelle)
W74-06755

COMPLEXIMETRIC DETERMINATION OF PHOSPHATE,
Alfa Materials Technology, Inc., Pottstown, Pa. Research Lab.
A. De Sousa.
Analytica Chimica Acta, Vol 67, No 1, p 234-235, November 1973. 2 ref.

Descriptors: *Phosphates, *Methodology, *Aqueous solutions, *Pollutant identification, Water analysis, Chemical analysis, Chemical reactions, Volumetric analysis, Color reactions.
Identifiers: *Complexiметric titration, Accuracy, Ionic interference, Chemical interference, EDTA, Chemical indicator, Murexide.

The complexiметric method described for the determination of phosphate ion is based on the rapid quantitative precipitation of silver orthophosphate from a neutral or slightly alkaline phosphate solution. The freshly precipitated silver phosphate is dissolved in an ammoniacal solution of potassium tetracyanonickelate and titrated with EDTA to a visual endpoint with murexide as indicator. The time required for phosphate determination is about 30 min. The method described gave satisfactory results for the determination of phosphate in the range 10.0-150.0 mg; the accuracy varied from 1.0 percent to 0.5 percent over this range. There was no interference from moderate amounts of Al, Ni, Co, Mn, Zn, Cd, Cu, Pb, Ca, Sr, Ba, and Mg, but vanadate, chromate, molybdate, tungstate and halide ions interfered. (Holoman-Battelle)
W74-06757

A UNIVERSAL ION-SELECTIVE ELECTRODE BASED ON GRAPHITE PASTE,
Connecticut Univ., Storrs. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-06758

AN EXAMINATION OF THREE STRAINS OF THE BLUE-GREEN ALGAL GENUS, FREMYELLA,
East Tennessee State Univ., Johnson City. Dept. of Biology.
For primary bibliographic entry see Field 5C.
W74-06759

THE GENUS NEOCHLORIS STARR (CHLOROPHYCEAE, CHLOROCOCCALES),
Slippery Rock State Coll., Pa. Dept. of Biology.
P. A. Archibald.
Phycologia, Vol 12, Nos 3/4, p 187-193, December 1973. 9 fig, 3 tab, 12 ref.

Descriptors: *Aquatic algae, *Soil algae, *Chlorophyta, Plant morphology, Plant growth, Plant physiology, Speciation, Systematics, Cultures, Isolation, Plant groupings, Plant pigments, Microscopy.
Identifiers: *Neochloris, Neochloris texensis, Neochloris conjuncta, Neochloris vigenis, Culture media, Neochloris alveolaris, Neochloris cohaerens, Neochloris minuta, Nechloris oleabundans, Neochloris pseudoalveolaris, Neochloris terrestris, Neochloris wimmeri, Neochloris aquatica, Neochloris conjuncta, Neochloris fusispora, Neochloris gelatinosa, Neochloris pyrenoidosa, Neochloris seudostigmata.

Study and culture of five isolates of the genus Neochloris revealed three previously undescribed species. A morphological key to all current species of Neochloris as cultured under standard conditions is provided. Supplementary growth patterns and physiological attributes are reported. (Holman-Battelle)
W74-06760

SELECTRODE - THE UNIVERSAL ION-SELECTIVE ELECTRODE. PART VI. THE CALCIUM (II) SELECTRODE EMPLOYING A NEW ION EXCHANGER IN A NONPOROUS MEMBRANE AND A SOLID-STATE REFERENCE SYSTEM,
Technical Univ. of Denmark, Lyngby. Kemisk Laboratorium A.
J. Ruzicka, E. H. Hansen, and J. C. Tjell.
Analytica Chimica Acta, Vol 67, No 1, p 155-178, November 1973. 11 fig, 3 tab, 39 ref.

Descriptors: *Water analysis, Materials, *Fabrication, Stability, Selectivity, Calibrations, Calcium, Ions, Aqueous solutions, Design criteria, Volumetric analysis, Hydrogen ion concentration, Sea water, *Electrodes.
Identifiers: *Ion selective electrodes, *Calcium electrodes, Calibration curves, Chemical interference, Membrane electrodes, Selectrodes.

The correlation between extraction data and electrode behavior was used to explain the vital properties of organophosphate-based calcium electrodes, and in suggesting a new liquid ion exchanger, di-(n-octylphenyl) phosphoric acid. This compound was synthesized and used in various electrode constructions including a newly developed membrane selectrode with a solid-state inner reference system. The resulting calcium(II) selectrode, calibrated in a series of calcium buffers, was subjected to potential-pH measurements, and used in EDTA titrations. The selectivity parameters of this electrode towards Na(plus), H(plus) and other foreign ions were found to be substantially better than those of any other calcium sensors previously described. (See also W74-06765, W73-01079 and W73-08800) (Little-Battelle)
W74-06764

SELECTRODE - THE UNIVERSAL ION-SELECTIVE ELECTRODE. PART VII. A VALINOMYCIN-BASED POTASSIUM ELECTRODE WITH NONPOROUS POLYMER MEMBRANE AND SOLID-STATE INNER REFERENCE SYSTEM,
Lund Univ., (Sweden).
U. Fiedler, and J. Ruzicka.
Analytica Chimica Acta, Vol 67, No 1, p 179-193, November 1973. 6 fig, 2 tab, 26 ref.

Descriptors: *Potassium, *Water analysis, *Aqueous solutions, Calibrations, Measurement, Volumetric analysis, Selectivity, *Electrodes.
Identifiers: *Ion selective electrodes, Chemical interference, Potassium electrodes, Calibration curves, Membrane electrodes, Selectrodes.

A potassium electrode utilizing a solution of valinomycin in diphenylether and a porous membrane is compared with selectrodes in which the diphenylether has been replaced by a suitable plasticizer and the porous membrane support by a polymer net-work. The development of the polymer membrane allows the use of simplified selectrode construction with a 'solid-state' calomel reference system. Rules for a successful choice of a suitable solvent-polymer combination are suggested and used for development of new polyvinylchloride- and polyurethane-based membranes. (See also W74-06764, W73-01079 and W73-08800) (Little-Battelle)
W74-06765

MERCURY AS A HYDROSPHERIC POLLUTANT II. BIOLOGICAL HALF-TIME OF METHYL MERCURY IN FOUR MEDITERRANEAN SPECIES: A FISH, A CRAB, AND TWO MOLLUSCS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
For primary bibliographic entry see Field 5C.
W74-06767

ENVIRONMENTAL MERCURY CONTAMINATION.
For primary bibliographic entry see Field 5B.
W74-06770

MERCURY CONTENTS OF BOTTOM SEDIMENTS FROM WISCONSIN RIVERS AND LAKES,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5B.
W74-06777

MERCURY LEVELS IN WISCONSIN FISH,
Wisconsin Dept. of Natural Resources, Madison.
For primary bibliographic entry see Field 5B.
W74-06778

METHODS OF ANALYSIS FOR MERCURY AND ITS COMPOUNDS: A REVIEW,
Michigan Univ., Ann Arbor. School of Public Health.
R. G. Smith.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 97-136, 1972. 460 ref.

Descriptors: *Mercury, *Analytical techniques, *Pollutant identification, *Bibliographies, Pollutants, Heavy metals, Chromatography, Colorimetry, Fluorescence, Gravimetric analysis, Microscopy, Neutron activation analysis, X-ray analysis, Chemistry, Evaluation, Instrumentation, Testing procedures, Spectrophotometry, *Reviews.
Identifiers: Atomic absorption spectrophotometry.

Papers concerned with mercury analysis are reviewed. The substances most frequently analyzed are organic materials. These present many difficulties because the mercury must be separated from the organic matter for precise measurements by complex ashing or other processes. The methods are divided into two classifications: elemental, total, and inorganic mercury analysis methods; and methods for analysis of organic mercury compounds. The first group contains activation analysis, atomic absorption and fluorescence, chromatographic analysis, colorimetric, electrometric, gravimetric, micrometric, radiometric, spectrographic, titrimetric, x-ray and miscellaneous methods of analysis. The second group contains alkyl and non-alkyl methods. The most widely used methods of mercury determination are those using the introduction of the color-forming reagent, dithizone, and the flameless or 'cold vapor' atomic absorption techniques. A listing of sources includes paper on the various techniques of analysis and additional sources dealing with analytical considerations, errors, calibration procedures, ashing problems and other review articles. (See also W74-06770) (Jerome-Vanderbilt)
W74-06785

PREPARATION OF BIOLOGICAL SAMPLES FOR NEUTRON ACTIVATION ANALYSIS OF MERCURY,
Western New York Nuclear Research Center, Inc., Buffalo.
K. K. S. Pillay.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 137-141, 1972. 3 tab, 2 ref.

Descriptors: *Mercury, *Neutron activation analysis, *Testing procedures, Evaluation, *Organic matter, Pollutants, Heavy metals, Analytical techniques, Sampling, Fish, Gamma rays, Foods, Public health, Metals, *Pollutant identification.
Identifiers: *Biological samples, Gamma rays spectrometry.

Several problems arising out of improper handling of samples can often cause significant losses of mercury in neutron activation analysis of biological and environmental material. The initial findings of an investigation of cold ashing techniques and/or freeze-drying methods to prepare convenient analytical samples of mercury are presented. Analysis of three fish homogenate sam-

ples and human brain tissues was performed using neutron activation analysis without pre-processing, followed by chemical separation and gamma-ray spectrometry. This process showed good agreement with results obtained by cold atomic absorption analysis. Freeze dried samples were reanalyzed and showed an obvious loss of mercury. It seems that neither freeze-drying nor cold ashing procedures are satisfactory for preparation of analytical samples of biological tissues for neutron irradiation. A more effective technique for handling biological tissues which are not subjected to any pre-processing is presented. (See also W74-06770) (Jerome-Vanderbilt)
W74-06786

MERCURY CONTENT OF CANADIAN FOODS AND CEREALS DETERMINED BY DIFFERENT METHODS,
Food and Drug Directorate, Ottawa (Ontario).
H. M. Cunningham, and J. C. Meranger.
In: Environmental Mercury Contamination, Ann Arbor Publishers, Inc., Michigan, p 141-146, 1972. 4 tab.

Descriptors: *Mercury, *Foods, *Analytical techniques, Neutron activation analysis, *Spectrophotometry, Pollutants, Water pollution, Diets, Testing, Laboratory tests, Heavy metals, Absorption, Evaluation, *Pollutant identification, *Canada.
Identifiers: Atomic absorption, Dithizone technique, Spectrophotometry.

Every three months, mixed diet samples representing 12 major classes of foodare collected and analyzed for trace minerals and other constituents by various Canadian organizations. The Association of Official Analytical Chemists analyzed 10 food samples for mercury using a dithiazone technique which revealed that none of the samples contained more than 1 ppm of mercury. The Food and Drug Directorate analyzed wheat and flour samples using a flameless atomic absorption technique. None of the samples tested contained above 0.013 ppm mercury. A comparison of results from flameless atomic absorption analysis and from neutron activation analysis showed discrepancies which could not be accounted for. (See also W74-06770) (Jerome-Vanderbilt)
W74-06787

A SIMPLE, RAPID METHOD FOR THE DETERMINATION OF TRACE MERCURY IN FISH VIA NEUTRON ACTIVATION ANALYSIS,
Michigan Univ., Ann Arbor. Dept. of Chemistry.
J. M. Rottschafter, J. D. Jones, and H. B. Mark, Jr.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 146-151, 1972. 3 tab, 4 ref.

Descriptors: *Fish, *Neutron activation analysis, *Mercury, *Ion exchange, *Pollutant identification, Laboratory tests, Analytical techniques, Heavy metals, Chemical reactions, Evaluation, Instrumentation, Calibration, Foods, Food chains.

A modified version of the neutron activation analysis method employs an anion-exchange column to adsorb mercury as a HgC14 complex. The standard radiochemical technique of adding a hold-back carrier prevents large losses of the sample of mercury during digestion and during the chemical steps preceding ion exchange. Weighed fish tissue samples were irradiated along with a sample used as an internal standard. Samples were then digested, diluted, and passed through an ion exchange column. The resin was removed from the column and counted in order to determine its mercury contents. The results of this method compared favorably with results obtained by other laboratiries using different methods of analysis. The lower level of analysis is estimated to be 10 ppb plus or minus 20%. Bromide ions were found to be the only observable source of interference. Preparation time is lowered to about 10 to 15 minutes per sample through simultaneous running. (See also W74-06770) (Jerome-Vanderbilt)
W74-06788

DETERMINATION OF MERCURY BY NON-DESTRUCTIVE NEUTRON ACTIVATION ANALYSIS,
Environmental Research Group, Ann Arbor, Mich.
R. A. Copeland.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 151-153, 1972. 3 ref.

Descriptors: *Neutron activation analysis, *Laboratory tests, *Mercury, *Pollutant identification, Analytical techniques, Testing, Evaluation, Measurements, Heavy metals, Data collection, Metals, *Non-destructive tests.
Identifiers: Selenium.

A non-destructive neutron activation analysis method, which is useful when it is necessary to make multiple elemental analyses on limited quantities of organic and sediment samples, is outlined. The samples are irradiated, allowed to decay and counted. The data are then stored on magnetic tape and pulse height analyses are performed by computer. A correction method for the interference contributed by selenium-75 is presented which produces less than 20% change in most organic samples which have a mercury concentration of more than 0.5 ppm. The disadvantages of this method are the long instrument and irradiation times required. The advantages are the non-destruction of the substance and the fact that the long measurement periods provide data on approximately 20 elements in addition to mercury. (See also W74-06770) (Jerome-Vanderbilt)
W74-06789

DETERMINATION OF MERCURY IN BIOLOGICAL TISSUES,
Environmental Science and Engineering Corp., Nashville, Tenn.
A. R. Schulert, J. T. Davis, and D. G. Nicholson.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 153-154, 1972.

Descriptors: *Analytical techniques, *Mercury, Spectroscopy, Biochemistry, Fish, Heavy metals, Measurement, Evaluation, Laboratory tests, *Pollutant identification, *Spectrophometry.
Identifiers: *Atomic absorption spectrophotometry, Mercury pollution.

Four published procedures for the atomic absorption analysis of mercury in fish muscle were tested to ascertain their adequacy. The procedure from the Perkin-Elmer Atomic Absorption Manual is inadequate because the radio-tracer added to the system is removed only to the extent of 2-10%. The Association of Official Analytical Chemists procedure, in which the sample is acid-digested, works well for inorganic material but is not effective in measureing mercury in fish. A system of condensation of evolved mercury vapor in a 'cold finger' apparatus was workable although rather expensive, tedious and subject to logistics problems. The most satisfactory procedure involved the combustion of the sample in a 1,000 C furnace under a flow of oxygen, absorbing out water and oxides of carbon and nitrogen, and then measuring the atomic absorption of the mercury vapor. (See also W74-06770) (Jerome-Vanderbilt)
W74-06790

THE DETERMINATION OF ETHYLMERCURY IN BLOOD,
Imperial Chemical Industries, Ltd., Alderly Park (England). Industrial Hygiene Research Lab.
J. C. Gage.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 155-156, 1972. 5 ref.

Descriptors: *Analytical techniques, Separation techniques, *Mercury, *Inorganic compounds, *Organic compounds, Chemical reactions, Chemical analysis, Laboratory tests, Evaluation, Poisons, Pollutant identification.
Identifiers: *Ethylmercury, *Blood analysis.

Methods used in the determination of organic and inorganic mercury in animals have been based upon solvent extraction or the varying lability of different organic mercurials in the presence of an acid-cysteine reagent. In testing the blood of workmen exposed to mercurial seed dressing containing small portions of an ethylmercury salt, difficulty was encountered using the acid-cysteine method. Investigation showed that separate determination of organic and inorganic mercury could be effected, in the presence of a strong solution of stannous chloride in alkali, by first blowing off the mercury from the inorganic salts with nitrogen, then changing to air or oxygen in order to break down the ethylmercury. The area of the tracing obtained with known amounts of ethylmercury chloride indicates that conversion is complete. A limited number of experiments have indicated that methylmercury is much more stable than ethylmercury and attempts to modify the method for the analysis of methylmercury have been unsuccessful. (See also W74-06770) (Jerome-Vanderbilt)
W74-06791

THE DETERMINATION OF MONO- AND DIMETHYLMERCURY COMPOUNDS BY GAS CHROMATOGRAPHY,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
R. Hartung.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 157-161, 1972, 2 fig, 2 tab, 2 ref.

Descriptors: *Analytical techniques, *Gas chromatrography, *Mercury, Separation techniques, Chemical reactions, Heavy metals, Organic compounds, Laboratory tests, Research and development, Measurement, *Pollutant identification, Sediments, Anaerobic conditions.
Identifiers: *Methylmercury.

A method for the determination of mono- and dimethylmercury in anaerobic sediments using gas chromatography is presented. The essential step in this method is the initial addition of a cysteine-borate buffer at pH 8.2 to the sample, in order to stabilize the dimethylmercury and to combine with any free monomethylmercury to form the water soluble cysteine adduct. The dimethylmercury is then extracted with toluene, converted to monomethylmercury and measured by electron-capture gas chromatography. This procedure improves the specificity of the test by producing a specific derivative and increases its sensitivity because of the strong electron affinity of methylmercuric bromide. Laboratory procedures and results of some studies using this method are presented. (See also W74-06770) (Jerome-Vanderbilt)
W74-06792

ANALYTICAL METHODOLOGY FOR MERCURY-DISCUSSION PAPER,
H. M. Benedict, J. N. Bishop, C. A. Burns, W. S. Ferguson, and J. C. Gage.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 161-162, 1972.

Descriptors: *Sampling, *Storage, Preservation, *Mercury, Stability, Fish, Analytical techniques, Separation techniques, Chemical reactions, Measurements, *Pollutant identification, Reviews.
Identifiers: *Sample preservation, Methylmercury.

Loss of mercury in sample storage and preparation presents unusual problems. Mercury loss in frozen fish stored in plastic bags was only 10% after a nine month storage period. Mercury in fish seems to be quite stable as long as the specimens have been properly preserved in nonplastic containers. The chelation of mercury from urine and water with ammoniumpyrolidinedithiocarbamate (APDC) and subsequent extraction into methylisobutylketone (MIBK) has been successful. When 0.2 ml of this extract was analyzed by routine atomic absorption techniques, sensitivities of 0.01 ppm to 0.005 ppm were reported. (See also W74-06770) (Jerome-Vanderbilt)
W74-06793

MERCURY CONCENTRATIONS IN HUMAN TISSUES AMONG HEAVY FISH EATERS,
New York State Dept. of Health, Albany.
For primary bibliographic entry see Field 5B.
W74-06812

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE FORT CALHOUN STATION, FORT CALHOUN, NEBRASKA, AUGUST 9-10, 1972.
EG and G, Inc., Las Vegas, Nev.
Available from NTIS, Springfield, Va., ARMS-72-6-4. $4.00 per paper copy, $1.45 in microfiche. Report No ARMS-72-6-4, Oct 1973. 18 p, 3 fig, 3 tab, 3 ref.

Descriptors: *Remote sensing, *Surveys, *Radioactivity, Measurement, *Air pollution, Water pollution, *Water pollution sources, Soil contamination, Fallout, Radioisotopes, Monitoring, Population, Food chains, Public health, *Nebraska, Equipment, Instrumentation, Data collections, Mapping, Contours, Missouri River, Remote sensing.
Identifiers: *Gamma radiation, Pressurized water reactor.

The Aerial Radiological Measuring System (ARMS) was used to survey the area surrounding the Fort Calhoun Station during August 1972. The survey measured terrestrial gamma radiation. A high-sensitivity detection system collected gamma-ray spectral and gross-count data. The data were then computer processed into a map of a 625 square mile area showing isoexposure contours three feet above the ground. Exposure rates and isotopes identified are consistent with normal terrestrial background. (Houser-ORNL)
W74-06815

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE PALISADES PLANT, SOUTH HAVEN, MICHIGAN, JULY 29, 1970.
EG and G, Inc., Las Vegas Nev.
Available from NTIS, Springfield, Va., as ARMS-70-6-8, $4.00 in paper copy, $1.45 in microfiche. Report No ARMS-70-6-8, Oct 1973. 18 p, 2 fig, 3 tab, 3 ref.

Descriptors: *Remote sensing, *Surveys, *Radioactivity, Measurement, *Air pollution, Water pollution, *Water pollution sources, Soil contamination, Nuclear powerplants, Effluents, Lake Michigan, *Michigan, Population, Food chains, Public health, Radioisotopes, Remote sensing.
Identifiers: *Gamma radiation, Pressurized water reactor.

The Aerial Radiological Measuring System (ARMS) was used to survey the area surrounding the Palisades Plant during July 1970. A high-sensitivity detection system collected gamma-ray spectral and gross-count data. The data were then computer processed into a map of a 300 square mile area showing isoexposure contours three feet above the ground. Exposure rates and isotopes identified are consistent with normal terrestrial background radiation. (Houser-ORNL)
W74-06816

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE ENRICO FERMI ATOMIC POWER PLANT, MONROE, MICHIGAN, SEPTEMBER 1970.
EG and G, Inc., Las Vegas, Nev.
Available from NTIS, Springfield, Va., as ARMS-70-6-7. $4.00 in paper copy, $1.45 in microfiche. Report No ARMS-70-6-7, Sept 1973. 18 p, 3 fig, 3 tab, 3 ref.

Descriptors: *Remote sensing, *Surveys, *Radioactivity, *Monitoring, Rivers, Lakes, Creeks, *Air pollution, Water pollution, Water pollution sources, Nuclear powerplants, Effluents, Contours, Mapping, *Michigan, Food chains, Public health, Population, Radioisotopes, Remote sensing.
Identifiers: Gamma radiation, Sodium cooled fast reactor.

The Aerial Radiological Measuring System (ARMS) was used to survey the Enrico Fermi Atomic Power Plant and surrounding area during September 1970. The survey measured terrestrial background gamma radiation and included a plume track of the stack release gases. A high-sensitivity detection system collected gamma-ray spectral and gross-count data. The data were then computer processed into a map of a 277 square mile area showing isoexposure contours three feet above the ground. Results indicated the presence of isotopes normally found in the background radiation throughout the United States. The plume track revealed no radiation above background levels. (Houser-ORNL)
W74-06817

THE STACK MONITORING SYSTEM AT THE IDAHO CHEMICAL PROCESSING PLANT,
Allied Chemical Corp., Idaho Falls, Idaho. Idaho Chemical Programs Operations Office.
R. C. Girton, L. T. Lakey, and D. T. Pence.
Available from the National Technical Information Service, Springfield, Va., as ICP-1034; $4.00 per copy, $1.45 microfiche. Report ICP-3034, September 1973. 36 p, 6 fig, 1 tab, 8 ref.

Descriptors: *Monitoring, *Control systems, *Idaho, Operations, *Regulation, Effluents, Flow rates, Fuels, Nuclear powerplants, *Air pollution, Measurement, Assay, Radioactivity, Particle size, Migration, Dispersion, Distribution, Filters, Homogeneity, Evaluation, Assessments, Safety, Public health, Fallout, Water pollution sources.
Identifiers: *Fuel processing, *Chemical processing, Fuel elements, Stack.

The effluent monitoring system used to measure airborne particulate emissions from the Idaho Chemical Processing Plant is described in detail. The efficiency of the system has been evaluated through studies of particle migration as a function of size, particulate plateout, particle size distribution, type of filter paper, flow rates, and the homogeneity of the gaseous effluents. Several deficiencies of the system have been identified and recommendations for improvement to meet present and anticipated pollution regulations are presented. (Houser-ORNL)
W74-06824

NEW METHODS OF NITRITE AND NITRATE ANALYSIS FOR NATURAL WATERS,
Wisconsin Univ., Madison. Dept. of Civil and Environmental Engineering.
P. J. Canney.
Available from the National Technical Information Service as PB-231 366, $11.25 in paper copy, $1.45 in microfiche. M.S. Thesis, 1973. 155 p, 34 fig, 21 tab, 38 ref. OWRR A-051-WIS(1). 14-31-0001-3850.

Descriptors: *Organic compounds, *Nitrites, *Nitrates, *Separation techniques, Aromatic compounds, Chemical reactions, *Pollutant identification, Chemical analysis, Water analysis.
Identifiers: *Ortho-diamines, Reagents.

Several aromatic ortho-diamines were found to react with NO2. After optimizing the conditions for these reactions two reagents were selected for method development, namely, 2,3-DAF (2,3-diaminofluroene) and DABSe, (the monopiazselenol of 3,3'-diaminobenzidine). The DABSe reagent was found to have high sensitivity when used with a DCE (1,2-dichlordethane) extraction but could not be used without extraction. A DCE extraction using 2,3-DAF was found to have the highest sensitivity of all the reagents evaluated and had the versatility of use without extraction. Studies showed that Fe(III) and MnO2 could cause significant interference. However, sample filtration was found to eliminate all of the MnO2. High levels of Fe (III) could be removed by use of a cation exchange resin. Attempts to find new NO3 reducing agents which would perform with the new reagents were unsuccessful. The Cd-Hg reduction column was used for NO3 reduction; with analysis with 2,3-DAF or DABSe. The DABSe and 2,3-DAF methods are adequate for NO2 and NO3 analysis. They are highly sensitive and the DAF-aqueous procedure is somewhat simpler than the sulfanilic acid method because of the need for only one reagent addition. The 2,3-DAFaqueous procedure should not be used for water containing high levels of organic material. The potential for using these reagents in NO3 analysis is great if adequate reducing agents can be found. (Chesters-Wisconsin)
W74-06836

EVALUATION OF A MICROWAVE-INDUCED PLASMA SPECTROMETER FOR TRACE ANALYSIS,
Environmental Protection Agency, Athens, Ga. Southeast Environmental Research Lab.
W. R. Seitz.
Copy Available from GPO Sup Doc as EP1.23:660/2-73-009; $0.65; microfiche from NTIS as PB-231 390 $1.45. Environmental Protection Agency, Technical Series Report EPA-660/2-73-009, January 1974. 19 p, 3 tab, 25 ref. ROAP 16ADN-32.

Descriptors: *Analytical Techniques, *Spectroscopy, Microwaves, *Trace elements, Arsenic, Cadmium, Lead, Mercury, *Metals, *Water analysis, *Pollutant identification.
Identifiers: Plasma, Excitation.

A low pressure microwave-induced plasma in helium was evaluated as an excitation source for spectrochemical analysis of trace metals in water. The sample was introduced by evaporating a 5-microliter drop of solution on a wire filament and atomizing the solids by the discharge of a capacitor through the filament. The height of the resulting pulse from the photo detector was automatically recorded. Repeatability was about 10% and detection limits were 1 to 25 pg for As, Cd, Hg, and Pb. Slopes of calibration curves depended strongly on matrix and filament effects and the maximum solids loading of the filament was about 5 micrograms. (Hoover-EPA)
W74-06841

STORMWATER RUNOFF QUALITY FOR URBAN AND SEMI-URBAN/RURAL WATERSHEDS,
Purdue Univ., Lafayette, Ind. Dept. of Environmental Engineering.
For primary bibliographic entry see Field 5B.
W74-06851

A RADIOACTIVE ISOTOPIC CHARACTERIZATION OF THE ENVIRONMENT NEAR WISCASSET, MAINE: A PREOPERATIONAL SURVEY

IN THE VICINITY OF THE MAINE YANKEE ATOMIC POWER PLANT,
Maine Univ., Orono. Dept. of Physics.
C. T. Hess, C. W. Smith, H. A. Kelley, and F. C. Rock.
Avail: Supt. of Documents, U.S. Printing Office, Washington, D.C., $1.20 per copy. Radiation Data and Reports, Vol 15, No 2, p 39-52, Feb 1974. 1 fig, 7 tab, 14 ref, 3 append.

Descriptors: *Maine, *Monitoring, *Sampling, Air, Soils, *Radioactivity, Uranium, Thorium, Potassium, Cesium, Nuclear powerplants, *Survey, Sediments, Tritium, Precipitation(Atmospheric) measurement, Assay, Instrumentation, *Path of pollutants.
Identifiers: *Montsweag Bay(Maine), Booth Bay(Maine), Young's Creek(Maine).

An environmental radioactivity survey was conducted in the vicinity of the Maine Yankee Atomic Power Plant prior to the operation of this facility. Measurements of environmental radioactivity were made on samples of soil, sediment, well water, surface water, estuarine water, air particulates, air moisture, and precipitation. Natural radioisotopes in the uranium and thorium series and potassium-40 were found in most of the samples. Cesium-137 also was found in some samples. (Houser-ORNL)
W74-06855

(RADIATION DATA, SECTION II. WATER).
Office of Radiation Programs, Washington, D.C.
Avail: Supt. of Documents, U.S. Printing Office, Washington, D.C., $1.20 per copy. Radiation Data and Reports, Vol 15, No 2, p 74-78, February 1974. 2 fig, 1 tab, 4 ref.

Descriptors: *Radioactivity, *Assay, Assessment, Safety, Evaluation, Nuclear explosions, Fallout, *Sampling, Public health, Standards, Water quality, Municipal water, *Water analysis, *Path of pollutants, Potable water.
Identifiers: *Surveillance program, *Nevada Test Site.

The Environmental Protection Agency and other Federal, State, and local agencies operate extensive water quality sampling and analysis programs for surface, ground, and treated water. Most of these programs include determinations of gross beta and gross alpha radioactivity and specific radionuclides. Although the determination of the total radionuclide intake from all sources is of primary importance, a measure of the public health importance of radioactivity levels in water can be obtained by comparison of the observed values with the Public Health Service Drinking Water Standards. These standards, based on consideration of Federal Radiation Council (FRC) recommendations set the limits for approval of a drinking water supply containing radium-226 and strontium-90 at 3 pCi/liter and 10 pCi/liter, respectively. Higher concentrations may be acceptable if the total intake of radioactivity from all sources remains within the guides recommended by FRC for control action. Surveillance data from a number of Federal and State programs are published periodically to show current and long-range trends. Water sampling activities reported in Radiation Data and Reports are listed. Tabular data are given for all analytical results of water samples. (Houser-ORNL)
W74-06856

SEMIMICRODETERMINATION OF MERCURY(II) AND ZINC(II) BY PRECIPITATION FROM HOMOGENEOUS SOLUTION, USING CATION GENERATION TECHNIQUE,
Delhi Univ. (India). Dept. of Chemistry.
K. N. Johri, and K. Bakshi.
Microchemical Journal, Vol 18, No 5, p 497-501, October 1973. 3 tab, 12 ref.

Descriptors: Chemical precipitation, *Mercury, *Zinc, *Gravimeteric analysis, Ions, *Pollutant identification, Heavy metals, Aqueous solutions, Water analysis, *Ion exchange, *Separation techniques.
Identifiers: EDTA, Potassium thiocarbonate, Masking, Ammonium tartrate, Chemical interference.

A gravimetric procedure for the evaluation of milligram quantities of mercury(II) and zinc(II) when present along with adverse ions is based on the technique of masking one or more constituents while precipitating the others. Besides potassium thiocarbonate (PTC), EDTA and ammonium tartrate have been employed as masking agents, thereby affording selective precipitation. In alkaline medium, PTC causes the precipitation of basic thiocarbonates of mercury and zinc. However, by the masking action of EDTA or ammonium tartrate, not only the hydroxide precipitation is prevented but the thiocarbonate precipitate obtained is clean and dense, having better filterable properties. The procedure for the determination of mercury is not applicable in the presence of Bi(III), Pb(II), and Cd(II) ions as the latter ions are also precipitated out with Hg(II). EDTA and ammonium tartrate, when added, prevent the precipitation of Zn(II), Cu(III), Al(III), Mo(VI), As(III), Sb(III), and Sn(II) against mercury(II). Cu(II), Ni(II), and Co(II) remain in the solution as their soluble thiocarbonate complexes with an excess of PTC. Since EDTA masks zinc completely against PTC, it could not be used in the case of zinc. Separations of zinc(II) have been carried out by adjusting the required pH of the solution. In acidic solution, Mo(VI), Sn(II), Sb(III), As(III), Cd(II), Hg(II) ions are separated from alkaline solution by adding an excess of PTC. (Mortland-Battelle)
W74-06869

ON THE REACTION BETWEEN IODIDE AND MERCURY(II),
Cairo Univ., Giza (Egypt). Faculty of Science.
H. Khalifa.
Microchemical Journal, Vol 18, No 5, p 529-535, October 1973. 1 tab, 15 ref.

Descriptors: *Mercury, *Ions, *Volumetric analysis, *Electrodes, *Iodides, Pollutant identification, Acidity, Chlorides, Nitrates, Aqueous solutions.
Identifiers: Ion selective electrodes, Acetates, Platinum electrodes, Silver electrodes, Amalgam, EDTA.

A survey on the iodide-mercury(II) reaction and its analytical uses is given. Titrations of iodide with mercury(II) in various acidities, using nitrate, acetate, and chloride as titrants and silver or platinum amalgam as the indicator electrode, showed that mercury(II) nitrate is the best titrant giving 0.46 V/0.1 ml potential break in comparison with 0.14 V/0.1 ml of mercury(II) chloride and 0.35 V/0.1 ml of mercury(II) acetate, all titrants being 0.05 M in mercury(II). (Mortland-Battelle)
W74-06870

ELECTRON-DONOR-ACCEPTOR COMPLEXING REAGENTS IN THE ANALYSIS OF PESTICIDES. VI. INFLUENCE OF STRUCTURE IN DETECTION AND IDENTIFICATION,
Dalhousie Univ., Halifax (Nova Scotia). Trace Analysis Research Centre.
J. D. MacNeil, R. W. Frei, and O. Hutzinger.
Mikrochimica Acts, No 5, p 641-650, 1973. 4 fig, 2 tab, 13 ref.

Descriptors: *Pesticides, *Pollutant identification, *Mass spectrometry, Degradation(Decomposition), Colorimetry, *Chromatography.
Identifiers: *Thin layer chromatography, Spray reagents, Electron acceptors, Electron donors, Mass spectra.

Pesticides may be detected following thin-layer chromatography by spraying the chromatogram with a reagent which forms a pi complex with the pesticide. The effect of various pesticide structures and substituents in choosing a suitable pi complexing reagent is discussed, as well as the effect of these factors in influencing the color of the complex formed. Quantitative analyses may be performed in situ on the thin-layer chromatogram and positive identification of the pi complexed compounds may be made by mass spectrometry. The procedure should be applicable for formulation analysis or studies of pesticide decomposition. The sensitivity of these reagents (1-10 micrograms) is not sufficient, however, for them to be regarded as having a useful potential in residue analysis. Their principal use will be in cases where a non-destructive colorimeteric method of detection offers an advantage. (See also W72-05440) (Mortland-Battelle)
W74-06871

ORGANIC FUNCTIONAL GROUP ANALYSIS VIA GAS CHROMATOGRAPY. III. DETERMINATION OF CARBAMATES BY REACTION WITH ALKALI,
Brooklyn Coll., N.Y. Dept. of Chemistry.
A. S. Ladas, and T. S. Ma.
Mikrochimica Acta, No 5, p 853-862, 1973. 4 fig, 1 tab, 18 ref.

Descriptors: *Carbamate pesticides, *Gas chromatography, *Alkalis(Bases), Alcohol, *Pollutant identification, Instrumentation.
Identifiers: Methyl carbamate, Ethyl carbamate, Iso-propyl carbanilate.

A gas chromatographic procedure for the analysis of carbamates employs a specially prepared reaction tube, packed with a 10 percent mixture of potassium hydroxide in glass beads, placed inside the injection port of a Perkin-Elmer 900 Gas Chromatograph in front of the chromatographic column packed with Porapak Q.S. A solution of the carbamates (0.01-0.1 micromole) is injected directly into the gas chromatograph. The carbamates are reacted with the alkali present in the reaction tube and the alcohols produced are separated, detected and recorded. Standard calibration graphs of the alcohols are prepared in the same manner and the quantities of carbamates are determined. The procedure is fast and quantitative. (Mortland-Battelle)
W74-06872

METHOD OF PREPARING WASHED SUSPENSIONS OF ANAEROBIC BACTERIA FOR METABOLIC STUDIES,
National Chemical Research Lab., Pretoria (South Africa).
C. Roche, J. Albertyn, and A. Kistner.
Laboratory Practice, Vol 22, No 10, p 633-634, October 1973. 2 fig, 1 tab, 3 ref.

Descriptors: *Anaerobic bacteria, *Centrifugation, Metabolism, Oxidation-reduction potential, Cultures, Laboratory equipment, *Pollutant identification.
Identifiers: *Washed suspensions, Butyrivibrio, Sample preparation.

In preparing washed suspensions of anaerobic bacteria for various microbiological studies, it is essential to avoid any exposure of the organisms to air or oxygen. An apparatus that minimizes the risk of exposure during centrifugation is described along with procedures for its use. Culture vessels were de-aerated using gas mixtures that were passed through a catalytic gas purifier cartridge. Copper and butyl rubber tubing were used to minimize diffusion of oxygen into the purified gas. In producing and maintaining low redox potentials during washing the composition of the reducing solution was arranged to be similar in ionic concentration to the growth medium. Deionized water, which was boiled and prepared under a

blanket of oxygen-free gas, was used for preparing the media and mineral solution. Membrane filtration was also used. All transfers of media and solution were made with sterile syringes. A specific application of the procedure to cultures of Butyrvibrio species is described. (Mortland-Battelle)
W74-06875

STREAM POLLUTION AND A SIMPLIFIED DIVERSITY INDEX,
Oberlin Coll., Ohio.
D. A. Egloff, and W. H. Brakel.
Journal Water Pollution Control Federation, Vol 45, No 11, p2269-2275, November 1973. 2 fig, 3 tab, 22 ref.

Descriptors: *Water pollution, Natural streams, *Bioindicators, *Benthic fauna, Waste water(Pollution), Biological communities, Water quality, Water pollution effects, *Biota, Aquatic animals, Bottom sampling, Invertebrates, Water quality standards, Dissolved oxygen, Physicochemical properties, Water chemistry, Water temperature, Biochemical oxygen demand, Nitrates.
Identifiers: *Species diversity index, Macroinvertebrates, Species diversity, Plum Creek, Fecal coliforms, Orthophosphates.

Biological indexes of diversity of benthic macroinvertebrate communities were determined at seven stations in a stream subjected to pollution by secondarily treated domestic wastewater. Indexes based on three different levels of taxonomic classification (genus, order, and class) all reflected the effect of the discharge on the biological communities. The advantages of using an index of biological diversity based on higher taxonomic categories include (1) direct assessment of the biological impact of pollution, (2) a great savings in time and technical expertise usually required to identify biological specimens to low taxonomic categories, and (3) the retention of some taxonomic information, which is required for making many biological inferences, especially with respect to the effect of pollution on biological food chains. (Holoman-Battelle)
W74-06876

USING ARTEMIA TO ASSAY OIL DISPERSANT TOXICITIES,
National Marine Water Quality Lab., West Kingston, R.I.
E. J. Zillioux, H. R. Foulk, J. C. Prager, and J. A. Cardin.
Journal Water Pollution Control Federation, Vol 45, No 11, p 2389-2396, November 1973. 6 fig, 4 tab, 7 ref.

Descriptors: *Bioassay, Design criteria, *Brine shrimp, Methodology, Sea water, *Toxicity, Eggs, *Assay, Water quality standards, Lethal limit.
Identifiers: *Oil dispersants, Standard methods, Nauplii, Sodium dodecyl sulfate, Sample preparation, *Artemia.

Criteria established for a procedure to assay oil dispersants included the following: (1) The assay must not require special training or skills by a technical level person. (2) Only common laboratory equipment would be required. (3) Materials and time must be minimal. (4) The results must be accurate and available in a short time. (5) The end point must be quantitatively measurable. (6) The organism must be sensitive to chemical changes, yet suitable for laboratory tests. (7) The species must be commercially available, be capable of being raised in the laboratory, and not require care between assays. (8) Large numbers of the organisms must require small volumes of medium. (9) Neither the assay nor the organisms must require a permanent allotment of laboratory space. These criteria were satisifed at least partially by designing a bioassay procedure which uses nauplii of Artemia salina in synthetic seawater under defined chemical and physical conditions. The brine shrimp are stored as eggs which are incubated and hatched when needed. Sodium dodecyl sulfate is used as a reference toxicant to indicate differences in the condition of organisms that may occur during the test. The procedures were used to compare 48 hr TL sub 50 values of six proprietary oil dispersants with that of sodium dodecyl sulfate. Factors and variations in method that may affect bioassay results are discussed. Conclusions are that Artemia is a suitable bioassay species to determine comparative toxicity of oil dispersant compounds but that it should not be used to determine limiting environmental concentrations for protection of marine life. (Little-Battelle)
W74-06877

NEW SPOT TESTS FOR NITRATES AND NITRITES,
Ain Shams Univ., Cairo (Egypt). Microanalytical Research Labs.
S. S. M. Hassan.
Microchemical Journal, Vol 18, No 5, p 486-490, October 1973. 9 ref.

Descriptors: *Nitrates, *Nitrites, *Aqueous solutions, *Chemical analysis, *Pollutant identification, Color.
Identifiers: Detection limits, Chemical interference, Sensitivity.

Nitrates can be determined by placing a drop of the test solution in a microtest tube with aqueous hydroquinone solution and HCl, covering the mouth of the tube with filter paper treated with Griess reagent, and heating. Development of a pink or red spot indicates nitrates. An alternative test involves cooling the aforementioned solution, shaking with ether, and placing one or two drops of this solution on filter paper spotted with tetra base. A blue stain indicates nitrates. The lower detection limit for both procedures is 50 micrograms of KNO3. Nitrites are determined by mixing a drop of test solution on a spot plate with one drop of Griess reagent. Nitrites produce a red color. The detection limit is 5 micrograms of KNO2. Nitrates are identified in the presence of nitrites by adding sodium azide to the test solution before applying one of the previously described procedures. The detection limit is 60 micrograms of KNO3. Nitrites can be detected in the presence of nitrates by the method described. The detection limit is 10 micrograms of KNO2. Further tests were conducted to detect interfering ions. (Little-Battelle)
W74-06878

QUANTITATIVE METHODS FOR PRELIMINARY DESIGN OF WATER QUALITY SURVEILLANCE SYSTEMS,
Raytheon Co., Portsmouth, R. I. Oceanographic and Environmental Services.
S. G. Chamberlain, C. V. Beckers, G. P. Grimsrud, and R. D. Shull.
Water Resources Bulletin, Vol 10, No 2, p 199-219, April 1974. 8 fig, 2 tab, 17 ref.

Descriptors: *Monitoring, *Water quality, *Water pollution control, Network design, Sampling, Cost-benefit analysis, Mathematical models, Data processing, *Indiana, *Illinois.
Identifiers: *Wabash River.

A preliminary phase of the design of water quality surveillance systems is the specification of sampling frequencies and station locations throughout the basin; that is, the development of an adequate space/time sampling plan. Quantitative methods were developed to identify candidate sets of sampling frequencies and station locations, and to establish priorities for implementing the different frequencies and locations. These methods are useful in cost/effectiveness analyses, and are based on the objective of pollution abatement. A spatial priority measure is dependent both on the water quality profile in the stream and on the information obtained from monitoring stations in other streams. A temporal sampling priority rating is a measure of the effectiveness of the surveillance system with respect to its ability to detect the violations in the standards. To illustrate the quantitative methods, the procedures were applied to the Wabash River Basin. (Knapp-USGS)
W74-06885

ANALYSIS OF THE FEASIBILITY OF AN EXPERIMENT TO MEASURE CARBON MONOXIDE IN THE ATMOSPHERE,
General Electric Co., Philadelphia, Pa.
M. H. Bortner, F. N. Alyea, R. N. Grenda, G. R. Liebling, and G. M. Levy.
Available from NTIS, Springfield, Va. 22151 as NASA CR-2303. Printed price $6.25 domestic; $8.75 foreign; $1.45 microfiche. National Aeronautics and Space Administration Contractor Report CR-2303, October 1973. 251 p, 42 fig, 45 tab, 35 ref, 2 append. NASA Contract NASA-10139.

Descriptors: *Air pollution, *Monitoring, *Instrumentation, Data collections, Pollutant identification, Optical properties.
Identifiers: *Carbon monoxide, Interferometers.

Atmospheric carbon monoxide was measured from a remote platform using the correlation interferometry technique. The method is feasible for obtaining a global carbon monoxide map and a vertical carbon monoxide profile. Data can be obtained with an accuracy of 10% using this technique on the first overtone band of CO at 2.3 micrometers. That band is much more suitable than the stronger fundamental band at 4.6 micrometers. Calculations for both wavelengths are presented to illustrate the effects of atmospheric temperature profiles, inversion layers, ground temperature and emissivity, CO profile, reflectivity, and atmospheric pressure. The applicable radiative transfer theory on which these calculations are based is described together with the principles of the technique. (Knapp-USGS)
W74-06917

SILVER CONCENTRATIONS IN ANTARCTIC SNOW AND FIRN,
Nevada Univ., Reno. Desert Research Inst.
J. A. Warburton, G. O. Linkletter, and L. G. Young.
Antarctic Journal, Vol 8, No 6, p 342-343, November-December 1973. 1 tab, 3 ref.

Descriptors: *Precipitation(Atmospheric), *Antarctic, Weather modification, Sampling, Spectrophotometry, Pollutant identification.
Identifiers: *Silver.

A worldwide 'baseline' for silver concentration in precipitation to which other measurements can be compared was made in Antarctica by virtue of its remote location and its high polar ice sheet. Samples were collected with a carefully cleaned stainless steel auger or polyethylene scoop, from pits. The average silver concentration for the antarctic snow and firn samples studied is 8 times 10 to the -13 power g silver per milliliter. This appears to provide an excellent baseline value for silver in precipitation. (Knapp)
W74-06930

PB-210 CONCENTRATION IN ICE MEASURED AT SOUTH POLE STATION,
Centre National de la Recherche Scientifique, Gif-sur-Yvette (France). Centre des Faibles Radioactivities.
J. Sanak.
Antarctic Journal, Vol 8, No 6, p 339, November-December 1973. 1 fig.

Descriptors: *Lead, *Snowpacks, *Antarctic, Precipitation(Atmospheric), Firn, Snow, Ice, Sampling, Lead radioisotopes, *Pollutant identification.

To test for Pb-210 at Amundsen-Scott South Pole Station, firn samples were collected in a 2-meter-deep pit. Each sample represented a 4-centimeter-thick layer of snow and was carefully collected and sealed in a polyethylene bag. Also an ice core was taken at a depth between 2 and 4 meters. The average decrease of the Pb-210 concentration yielded the rate of snow accumulation. The mean annual rate was 10.0 centimeters of water between 1952 and 1971. The variations of the Pb-210 concentration around the average value seem to be important and cannot be attributed to manipulation errors. (Knapp-USGS)
W74-06932

GROUND WATER QUALITY DATA FOR PLANNING, MONITORING AND SURVEILLANCE,
California State Dept. of Water Resources, Sacramento. Div. of Resources Development.
J. L. Welsh.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 58-63, December 1973.

Descriptors: *Water quality, *Monitoring, *Groundwater, Data storage and retrieval, Data processing, Hydrogeology, Data collections, Hydrologic data, *California.

Interpretation of groundwater quality data must rest on a base of reliable knowledge of the geologic structure and the hydrologic regimen. The description of the resource quality must include the quality of each aquifer separately as well as the quality of the produced groundwater. The produced groundwater is a mixture of aquifer waters depending on the location of perforations in the well, aquifer yield characteristics and the pressures in the aquifers perforated. The description must be based on sufficient data to interpolate reliably between data points and present a clear picture of quality of groundwater areally and vertically. A greater problem exists in determining specific data requirements for surveillance of nonpoint or diffuse sources of pollution and to ascertain the effects of controls. A much broader area needs to be monitored because nonpoint sources by their nature affect large areas. The system used in California for processing water-quality data has the capability for retrieving and analyzing the stored data statistically and graphically as well as in standard listing forms. (See also W74-06942) (Knapp-USGS)
W74-06947

QUALITY OF GROUND WATER IN THE LOWER COLORADO RIVER REGION, ARIZONA, NEVADA, NEW MEXICO, AND UTAH,
Geological Survey, Washington, D. C.
For primary bibliographic entry see Field 7C.
W74-06960

ATOMIC ABSORPTION DETECTOR FOR LIQUID-LIQUID CHROMATOGRAPHY,
Missouri Univ., Columbia. Dept. of Chemistry.
S. E. Manahan, and D. R. Jones, IV.
Analytical Letters, Vol 6, No 8, p 745-753, 1973. OWRR A-056-MO(3). 14-31-0001-3925.

Descriptors: *Chelation, Spectroscopy, *Chromatography, Nitribotriacetic acid, Analytical techniques, *Pollutant identification, *Ion exchange, Cations.
Identifiers: EDTA, *Atomic absorption, Detectors, *Chelating agents.

Because of their role in the solubilization and transport of heavy metal ions and algal nutrient metals, chelating agents are very important in natural waters and wastewaters. They have not been extensively studied, largely because of the lack of analysis methods for them. High-speed liquid chromatography potentially is one of the most useful methods for the analysis of aquatic chelating agents because of its ability to separate species in their natural medium (water). This technique has been handicapped by lack of sensitive and specific detectors. A detector system for chelating agents has been developed. The sample passes through a short column of chelating ion exchange resin bound to copper. An equivalent amount of copper is solubilized from the resin and is aspirated directly into an atomic absorption spectrophotometer set to measure copper. A peak with an area proportional to the amount of chelating agent is recorded. The method is accurate to approximately 3%. As little as 5x10 to the power -7 millimoles of EDTA or NTA can be detected. Interferences from divalent cations can be elminated by exchanging sodium for the divalent cations with an ion exchanger.
W74-06998

AN ATOMIC ABSORPTION ANALYSIS METHOD FOR CYANIDE,
Missouri Univ., Columbia. Dept. of Chemistry.
S. E. Manahan, and R. Kunkel.
Analytical Letters, Vol 6, No 6, p 547-553, 1973. OWRR A-056-MO(2). 14-31-0001-3825.

Descriptors: Pollution, *Cyanide, *Spectroscopy, Plating, Mining, Waste waters, Copper, Sewage, *Pollutant identification, Analytical techniques, Metals, Ions, Methodology.
Identifiers: *Atomic absorption, Stoichiometry, *Complexation, Plating, *Metal ions.

Complexing agents are species which bind to metal ions and generally serve to keep metals in solution. Many significant metals form strong complexes. Among such metals are iron, copper, and mercury. Complexation probably is very significant in the solubilization and transport of heavy metals through natural water systems and waste treatment processes. Therefore, a need exists for the development of methods for the analysis of complexing agents in water. Cyanide ion is a significant complexing agent and is also toxic. It is a common component of mining, metal refining, and plating waste. An atomic absorption analysis method for cyanide is described. The method depends upon the solubilization of copper(II) from an insoluble basic copper salt at pH 10. An amount of copper remaining in solution equivalent to 1/3 of the molar cyanide ion concentration originally present is measured to give cyanide ion concentration. Apparently the complex ion, Cu(CN)3, is the soluble copper complex, and no formation of cuprous cyanide was observed at low cyanide ion concentrations. The method is sensitive down to 2.0x10 to the power -5 M cyanide ion concentration. Reasonable levels of iron do not interfere. The recovery of cyanide from spiked secondary sewage effluent samples is demonstrated.
W74-06999

ORIGIN OF CIRCULAR BEDS OF THALASSIA (SPERMATOPHYTA:HYDROCHARITACEAE) IN SOUTH BISCAYNE BAY, FLORIDA, AND THEIR RELATIONSHIP TO MANGROVE HAMMOCKS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
J. C. Zieman, Jr.
Bull Mar Sci. Vol 22, No 3, p 559-574. 1972. Illus.
Identifiers: *Aerial photography, Bays, *Biscayne Bay(Fla), Burrows, Callianassid, *Florida, Hydrocharitaceae, *Mangrove hammocks, Origin, Peat, Relationship, Rhizophora, Spermatophyta, *Thalassia, Worms, Estuaries.

Comparisons of aerial photographs of a mangrove shoreline and an adjacent estuarine area in southwestern Biscayne Bay, Florida, showed the presence of numerous circular to teardrop-shaped areas. The circular areas on shore are hammocks of mangroves and other tropical trees and they are over depressions in the bedrock which are filled with mangrove peat. The circular areas in the estuary are beds of T. testudinum. These nearly always occur over depressions in the bedrock that are filled with autochthonous mangrove (Rhizophora) peat. The peats reach a pH of 4.9 and a depth of 5 m. Thalassia beds are often surrounded by a white halo fo worm and callianassid burrows in the broken area at the periphery of the depressions in the bedrock. The effect of sediment depth on density and length of blades is shown. Dated mangrove peat from beneath a Thalassia bed 3 m below present sea level was 3680 yr old. In this area the mangrove shoreline receded as sea level rose, and the beds of Thalassia then colonized the planed-off hammocks.--Copyright 1973, Biological Abstracts, Inc.
W74-07022

INVESTIGATION OF BREWING WATER TREATMENT,
A. Totsuka, T. Sumikawa, H. Ogino, Y. Namba, and Y. Komuyama.
Rep Res Inst Brew. 143. p 40-48. 1971.
Identifiers: Ammonia, *Brewing waters(Treatment), Copper, Iron, Manganese, Methodology, Nitrites, Zinc, *Waste water treatment, *Pollutant identification, *Flame photometry.

Collecting the 44 brewing waters treated with various instruments, the changes of components before and after treatment were analyzed by flame photometry for K and Na, atomic absorption spectrophotometery for other metals, and conventional method for other components. To judge water treatments, the standard contents in water were as follows: Fe, Mn, Zn and Cu were less than 0.02 ppm, organic substances determined by KMnO4 consumption were less than 5.0 ppm, and ammonia and nitrite contents were less than 0.04 and 0.01 ppm, respectively. Only 2 samples were treated effectively. The reasons for poor treatments are either mis-management or mis-application of instruments. Celite and other filtration agents do not cause removal of ammonia and metals. Sand filtration must be used in combination with other treatments. Aeration or chlorination-sand filtration methods do not reach the standard level. The Fe bacterial method removes the Fe effectively but other components are not excluded. Active C treatment cannot reach the standard level because of contamination of minerals and the existence of unremovable substances. The manganese zeolite method is insufficient because of leakage of Mn from the packed column. Ion exchange resin is probably the most effective treatment but should be used in combination with other instruments. Though the incomplete growth and breakdown of flocculate occurs, the coagulation method removes Fe; but this method should be used in combination with other instruments.--Copyright 1973, Biological Abstracts, Inc.
W74-07023

THE MERCURY CONTENT OF PREHISTORIC FISH,
Michigan Univ., Ann Arbor. Museum of Anthropology.
E. N. Wilmsen, and J. T. Meyers.
Ecol Food Nutr. Vol 1, No 3, p 179-186. 1972. Illus.
Identifiers: Aplodinotus-grunniens, *Fish, Ictalurus-punctatus, *Mercury, Phylodictis-olivaris, Prehistoric, Channel catfish, Drum, Flathead catfish, Illinois, Apple Creek(Ill), Michigan, *Catfish, Pollutant identification.

Seventeen samples of fish remains were analyzed for Hg content by a neutron activation technique. Three samples were from Apple Creek, a Late Woodland site in central Illinois which is dated shortly after 400 A.D. Five samples were from the Schultz site in Saginaw County, Michigan, a Middle Woodland location slightly older than Apple Creek. The remaining 9 samples were from the

pre-Inca Chilca site located on the central coast of Peru. Freshwater species tested were Ictalurus punctatus (channel catfish), Pylodictis olivaris (flathead catfish), and Aplodinotus grunniens (drum). Five modern samples of these species from streams near Apple Creek were analyzed as a control. Peruvian salt water species have not yet been identified but are probably tuna and anchovy. Samples of the soil matrix in which the Chilca and Schultz specimens were found were also tested. Twelve of the prehistoric samples contained Hg in detectable quantities ranging from 0.014-9.463 ppm. Only one of the modern samples contained detectable Hg and neither soil sample had Hg in detectable amounts. The importance of archaeological data for establishing baselines for modern environmental evaluations is discussed. Implications of these data for modern disposal practices are considered.--Copyright 1973, Biological Abstracts, Inc.
W74-07026

5B. Sources Of Pollution

MERCURY IN THE ENVIRONMENT,
Hope Coll., Holland, Mich. Dept. of Chemistry.
D. H. Klein.
Copy available from GPO Sup Doc as EP1.23:660/2-73-008, $0.65; microfiche from NTIS as PB 231 256 $1.45. Environmental Protection Agency Technology Series Report EPA-660/2-73-008, December 1973. 23 p, 6 tab, 9 ref. EPA Project 16040 FRL.

Descriptors: *Mercury, *Metals, Water pollution, Air pollution, *Water pollution sources, Soil contamination, Sediments, Suspended solids, Path of pollutants, *Michigan, Treatment facilities.
Identifiers: *Air pollution sources, Sewage treatment plants, Coal-burning power plants.

Results are presented of studies of dilute discharges of mercury and some other metals into the characteristically low-metals environment of western Michigan, together with information on the transport of some of these metals through the environment, and on their sinks in the sediments. Atmospheric discharge sources include power plants, airports, asphalt plants, and general urban industrialization. Metals less volatile than mercury are deposited in surface soils near the point of discharge, but only a small portion of the mercury is deposited near the point of discharge. Sewage treatment plants represent a source of discharge of fairly large amounts of mercury-about 1000 lb per million population. This mercury is associated primarily with the suspended solids. In local lakes and rivers, mercury is also associated primarily with the suspended solids. In sediments, the concentrations of mercury and other metals correlate strongly with the organic content and the fraction of fine particulates. (Alford-EPA)
W74-06523

OXIDATION OF ORGANIC MATTER IN SEDIMENTS,
Washington Univ., Seattle. Dept. of Oceanography.
For primary bibliographic entry see Field 5C.
W74-06528

FRESHWATER BIOLOGY AND POLLUTION ECOLOGY: TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
For primary bibliographic entry see Field 5A.
W74-06558

THE IMPACT OF SLIMES-DAM FORMATION ON WATER QUALITY AND POLLUTION,
Department of Water Affairs, Pretoria (South Africa).
T. R. Rudd.
Journal of the South African Institute of Mining and Metallurgy, Vol 74, No 5, p 184-192, December 1973. 6 fig, 10 tab, 4 ref.

Descriptors: Water pollution sources, Impaired water quality, *Coal mine wastes, Pyrite, Sulfate, Fluorides, *Path of pollutants, Toxicity.
Identifiers: *Slimes dams, *Gold mine wastes, Fluorspar, *South Africa, Witwatersrand(So Afr), Natal(So Afr).

Slimes dams have a considerable effect on the quality of water for urban, industrial and mining use in large areas of South Africa, both within and beyond the mining areas where the dams were built. The main mineral pollutants are pyrites (FeS2) associated with gold and coal mining, and fluorspar (CaF2) from fluorspar mines as well as from some coal and iron mines. As fluorspar generally occurs in dolomitic areas there is a danger that it may poison major ground-water resources. The effect of coal mining on 2 typical rivers in Natal is discussed, and the spread of pollutants (sulphates and fluorides) from the Witwatersrand gold mines and their impact on urban and agricultural use of water downstream of the Barrage are illustrated. The diminishing sulphate content of certain tributaries indicates that in time the increase in pollution may be halted or reversed by stricter control over industrial wastes reaching the sewers and rivers, reclamation work on slimes dams and dumps, further leaching of the slimes, and decreased pumping by the mines. (DWA)
W74-06604

AN ECOLOGICAL ACCOUNT OF THE PAST AND FUTURE OF SOUTH AFRICAN RIVERS,
National Inst. for Water Research, Congella (South Africa). Regional Lab.
For primary bibliographic entry see Field 5C.
W74-06606

THE EFFECT OF POLLUTION ON THE VAAL RIVER BARRAGE AND THE QUEST FOR WATER QUALITY,
Rand Water Board, Johannesburg (South Africa).
R. J. Laburn.
The Civil Engineer in South Africa, Vol 16, No 2, p 62-65, February 1974. 2 fig.

Descriptors: *Water pollution, *Water pollution sources, *Water pollution control, Reservoir operation, Waste water treatment, Water reuse.
Identifiers: *South Africa(Vaal River).

The Rand Water Board supplies water from the Vaal River to a highly industrialized 16,400 sq km area in the Pretoria - Johannesburg-Vereeniging region which generates 60 per cent of the gross national product and has a population of 4 million people. In 1973 the Board supplied an average daily quantity of 1,360 ml/d. Water derived from Vaal Dam upstream of the Barrage is of good quality but accretions between Vaal Dam and the Barrage from tributaries which drain from areas of intensive mining and industrial activity have caused an accelerating increase in dissolved solids, especially sulphates, carbonates and chlorides, and accordingly in chlorine dosage for purification. Possible solutions discussed are the tracing and control of sources of pollution, the separation of different types of polluted water, reuse of sewage effluent, and a dual system of water supply whereby two qualities of water would be provided. Ways of financing these measures are considered. (DWA)
W74-06607

UTILIZATION OF PHOSPHORUS BY PHYTOPLANKTON IN PHOSPHORUS-RICH ENVIRONMENTS,
Georgia Inst. of Tech., Atlanta. School of Biology.
For primary bibliographic entry see Field 5C.
W74-06611

DENITRIFICATION AS A PATHWAY FOR NITRATE REMOVAL IN AQUATIC SYSTEMS,
Purdue Univ., Lafayette, Ind. Dept. of Agronomy.
D. W. Nelson, L. B. Owens, and R. E. Terry.
Available from the National Technical Information Service as PB-231 305, $4.00 in paper copy, $1.45 in microfiche. Indiana Water Resources Research Center, Lafayette, Technical Report No. 42, December 1973. 82 p, 7 fig, 27 tab, 11 ref. OWRR-A-019-IND(3).

Descriptors: *Denitrification, *Anaerobic bacteria, *Lake sediments, *Sediment-water interface, *Nitrates, Nitrites, Dissolved oxygen, Anaerobic conditions, Organic compounds, Carbon, Sediments, Nitrogen, Isotopes.
Identifiers: Glucose, Organic carbon, N-15 isotope.

Denitrification was determined by decrease in total nitrogen in a water media or by a decrease in N-15 labelled nitrate in sediment systems. It was established that the numbers of denitrifying bacteria, pH, and nitrate concentration of most surface waters will support denitrification. The process is inhibited by high dissolved oxygen and low dissolved organic carbon. Low temperature also restricts denitrification. River water samples exhibited denitrification when amended with glucose and nitrate under anaerobic conditions, whereas, pond waters did not. The findings indicated that denitrification in the water phase is insignificant to the nitrogen status of most streams and lakes. However denitrification in sediments may result in a large removal of nitrate from aquatic systems each year. Due to the large denitrifying capacities of sediments, it seems likely that denitrification is limited primarily by the relatively low amounts of nitrate entering the sediment by seepage through the lake bottom or by diffusion of nitrate from the overlying water in response to a concentration gradient.
W74-06612

UNRECORDED POLLUTION AND DYNAMICS OF BIOCHEMICAL OXYGEN DEMAND,
Rutgers - The State Univ., New Brunswick, N.J.
W. Whipple, Jr., J. V. Hunter, S. L. Yu, J. P. Hewitt, and J. Cirello.
Available from the National Technical Information Service as PB-231 306, $4.00 in paper copy, $1.45 in microfiche. New Jersey Water Resources Research Institute, New Brunswick, March 1974, 77 p, 20 fig, 22 tab, 48 ref. OWRR A-025-NJ(4). 14-01-0001-3030.

Descriptors: *Water pollution sources, Water quality, *Biochemical oxygen demand, *Urban runoff, Water quality control, Nutrients, Oxygen demand, Urban areas, *New Jersey, Model studies.
Identifiers: Unrecorded pollution, *Non-point pollution sources, *Oxygen demand kinetics, *Water quality models, *Morristown(N.J.).

Results are presented of a four year investigation of the dynamics of biochemical oxygen demand in polluted streams, and of unrecorded origins of such pollution. Data were obtained from watersheds of differing characteristics, including undeveloped woodlands, row crops, single family suburban housing and urban areas. Samples were taken over about a 2 1/2 year period, and analyzed for both 5 day and longer period BOD. It was found that single family suburban housing and row crops in flat land provide only a moderate increase of organic pollution over the undeveloped areas; but that urban watersheds tested are major pollution sources. Very large increases in pollution loading were found for days of rainfall as compared to dry days. A special study of Morristown, N.J. provided a provisional measure of per capita organic pollution to be expected in a clean urban area without major industrial activities. Frequency distributions of the BOD concentrations were prepared. Also seasonal variations of the BOD loadings indicate that loadings much higher than annual average values could be expected for

spring and early summer months. Studies were made of the variation of biochemical oxygen with time, in order to apply to the water quality modelling of polluted streams. The classic first order model was found not to represent the actual situation very adequately. Other equations which have been suggested were also tested. Finally a new equation was derived which proved to be statistically more satisfactory, and relatively simple to apply. Certain new concepts are suggested for the application of BOD data to water quality modelling of polluted streams. (Whipple-Rutgers)
W74-06613

CHLORINE PRODUCTION DROPS AS DEMAND LAGS.
Chemical and Engineering News, Vol 49, No 46, p 10-11, November 8, 1971. 2 fig.

Descriptors: *Chlorine, *Industrial production, *Industrial wastes, *Mercury, Water pollution, Plastics, Solvents, Pulp and paper Industry, Air pollution, Pollution abatement, *Demand.

The annual production of chlorine has been dropping from 6-7% per year. The reason is that chlorine's largest markets, including vinyl chloride, chlorinated solvents, and paper production face declining business. The mercury pollution problem has had little effect on chlorine capacity. Only two plants out of 30 reporting had stopped using mercury. Loss of mercury in water wastes has been reduced on an industry average to 2% of the January 1, 1970 level. Chlorine producers are now working to reduce emissions of mercury to the atmosphere. One plant had to shut down, being unable to cope with the problem. The mercury cell use is declining. Most new plants will probably use diaphragm cells. (Oleszkiewicz- Vanderbilt)
W74-06766

ENVIRONMENTAL MERCURY CONTAMINATION.
Ann Arbor Science Publishers, Inc., Ann Arbor, Michigan, 1972, R. Hartung and B. D. Dinman, editors. 349 p.

Descriptors: *Mercury, *Environmental effects, *Analytical techniques, *Public health, Pollutants, Water pollution, Air pollution, Soil contamination, Wastes, Effluents, Toxicity, Agricultural chemicals, Organic compounds, Inorganic compounds, Chemical reactions, Poisons, Distribution patterns, Fish, Bioassay, Birds, Laboratory tests, Path of pollutants, Food chains, Sediments, Aquatic life, Pathology, Biochemistry.

This volume is a compilation of much of the available knowledge on the subject of mercury contamination. Papers were presented at the International Conference on Environmental Mercury Contamination, held in Ann Arbor, Michigan, September 30, 1970-October 2, 1970. Discussion material has been added to most of these papers to improve their content and readability. A comprehensive coverage of the topic is presented by dividing the papers into four groups: the occurrence of mercury in the environment and man; methods of analysis; environmental dynamics of mercury; and the biological effects of mercury compounds. (See W74-06771 thru W74-06814) (Jerome-Vanderbilt)
W74-06770

SOURCES OF MERCURY IN THE ENVIRONMENT,
Michigan State Univ., East Lansing. Inst. of Water Research.
F. M. D'Itri.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 5-25, 1972. 76 ref.

Descriptors: *Water pollution sources, *Mercury, *Agricultural chemicals, *Chemical wastes, *Industrial wastes, *Fossil fuels, Pollutants, Wastes, Toxins, Metals, Effluents, Heavy metals, Sewage effluents, Organic compounds, Inorganic compounds, Metallurgy, Water quality control, Electrical equipment, Environmental effects, Air pollution, Coals.
Identifiers: *Methylmercury, Phenylmercury, Chlor-alkali production.

Two major sources of mercury are named; the natural occurrence of elemental mercury found in the earth's crust, and the mercury introduced into the environment from various human activities. Based on 1968 statistics, the largest industrial consumptions of mercury were in the electrical apparatus (26.6%) industry, industrial control instrument manufacture (10.6%), the manufacture of chlor-alkali products (23.1%), and in the phenyl mercury derivatives used in paint manufacturing (14.4%). Other areas of mercury consumption included agricultural slimicides, dental preparations, and metallurgical processing. The total amount of mercury consumed in 1968 was over 5.7 million pounds. Mercury enters the environment directly from nearly all the manufacturing processes, resulting from a failure to utilize the appropriate pollution abatement systems, and through the use of agricultural products containing organo-mercuric compounds. Indirect introduction of mercury into the environment results from the use, misuse and disposal of industrial and consumer products containing mercury. Fossil fuels also contain small amounts of mercury which account for a considerable amount of mercury released because of the use of large quantities of these substances. (See also W74-06770) (Jerome-Vanderbilt)
W74-06771

SOME ESTIMATES OF NATURAL LEVELS OF MERCURY IN THE ENVIRONMENT,
Hope Coll., Holland, Mich. Dept. of Chemistry.
D. H. Klein.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 25-29, 1972. 1 fig, 7 ref.

Descriptors: *Mercury, *Estimating, *Sampling, *Distribution patterns, Pollutants, Air pollution, Water pollution, Soil contamination, Statistics, Data processing, Geochemistry, Transfer, Lakes, Ponds, Streams, Atmosphere, *Path of pollutants.

It is estimated that natural weathering, including river and stream transport, transfers mercury through the environment at a rate of about 5000 tons per year. Another 5000 tons per year is estimated to be involved in manmade transport systems. It is important to know the natural levels of mercury in the environment in order to calculate the amount of mercury contamination due to human activities. Air pollution study readings taken at an elevation of 10,000 ft about 20 miles offshore from the San Francisco Bay region gave mercury concentrations averages slightly below 1 ng/cubic meter. Atmospheric measurements over land ranged from 1 to 50 ng/cu.m. with the average level being 3 ng/cu.m. and high levels in industrial or mining areas. Soil samples from the St. Clair industrial region indicate that atmospheric mercury transport is highly dependent upon wind and rain factors. Data from 67 samples taken from fresh water lakes, ponds, and rivers in the northeastern U.S. are presented as a concentration frequency diagram. The mean level is about 0.05 ppb, while the values are up to 2.8 ppb. The figures presented are subject to further refinement since natural levels are likely to vary with the geology of a given region. (See also W74-06770) (Jerome-Vanderbilt)
W74-06772

THE MERCURY POLLUTION PROBLEM IN MICHIGAN,
Michigan Dept. of Natural Resources, Lansing. Water Resources Commission.
W. G. Turney.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 29-31, 1972.

Descriptors: *Mercury, *Michigan, *Industrial wastes, *Water pollution sources, *Algicides, Pollutants, Air pollution, Soil contamination, Water pollution, Heavy metals, Soil, Lakes, Rivers, Coals, Analysis, Chemical analysis, Atmosphere, Electric power industry.

Possible sources of environmental mercury contamination in Michigan were investigated. The Wyandotte Chemical Company was found to be discharging from 10 to 20 pounds of mercury per day, while a small General Electric plant released approximately 1500 pounds of elemental mercury per year into the local environment. Although there was a fishery in the area near the G. E. Plant, no damage was found. Phenylmercury acetate was used by many communities and industries as an algicide and slimicide in air conditioning cooling towers but it is no longer used or manufactured in Michigan. Seals and other equipment in water treatment facilities contain some mercury which could be of some danger as contaminating agents. Coal from southeastern Ohio which is used by two Michigan power companies was analyzed and found to contain 0.5 ppm mercury. Since an analysis of power plant ash indicates insignificant mercury content it was concluded that this mercury was released into the atmosphere. (See also W74-06770) (Jerome-Vanderbilt)
W74-06773

MERCURY IN FISH IN THE GREAT LAKES,
Michigan Dept. of Natural Resources, Lansing. Fish Div.
J. D. Bails.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 31-37, 1972. 5 fig, 2 ref.

Descriptors: *Mercury, *Water pollution sources, *Sampling, Chemical analysis, *Fish, *Lake Michigan, *Lake Erie, Pollutants, Heavy metals, Data collections, Analytical techniques, Rock bass, Walleye, Catfish, Yellow perch, Chemical wastes, Great Lakes, Path of pollutants, Food chains.
Identifiers: *Lake St. Clair.

Sampling of fish in the Great Lakes region has been practiced since it was first discovered that mercury was a hazard. However, extensive sampling was initiated only after the Lake St. Clair incident in March 1970 when Canada announced that 12,000 pounds of walleye from Lake St. Clair were to be destroyed because of mercury contamination. Until 1970 a random approach was taken to determine the species the number of fish which exceeded 0.5 ppm mercury. This did not provide the data on a given species which is necessary for understanding of the problem. In July 1970 sampling stations were established in Michigan waters along with standards for sample size, species and portions to be analyzed. Walleye, yellow perch, catfish and rock bass were chosen as index species. The highest levels of mercury were found in walleye from Lake St. Clair while lower levels were found in walleye from lake Erie. Mercury concentrations in walleye ranged from a high of 3 ppm to 1 ppm. The pattern was the same for yellow perch with values ranging from 2.2 ppm to 0.2 ppm. Several factors which complicate the evaluation of data are listed. Although a decline in the level of mercury pollution should be detected with the passage of time, the fish taken from Lake St. Clair will not be suitable for human comsumption for a number of years. (See also W74-06770) (Jerome-Vanderbilt)
W74-06774

SURVEY OF MERCURY CONCENTRATIONS IN FISHES OF LAKES ST. CLAIR, ERIE, AND HURON,
Bureau of Commercial Fisheries, Ann Arbor, Mich. Technological Lab.
R. A. Greig, and H. L. Seagran.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 38-45, 1972. 3 fig, 5 tab.

Descriptors: *Mercury, *Distribution patterns, *Lake Huron, *Lake Erie, *Fish, *Sampling, Pollutants, Water pollution, Heavy metals, Great Lakes, Walleye, Drums, White bass, Yellow perch, Bioindicators, Data processing, Analysis.
Identifiers: *Lake St. Clair.

Findings are summarized of a preliminary survey of mercury concentrations in fish collected over the period from March 27 to May 8, 1970 from the U.S. waters of Lakes Erie, Huron, and St. Clair. These findings are related to geographic area and species differences. Data from Lake St. Clair show that essentially all the fish examined contained mercury concentrations considerably in excess of the U.S. Food and Drug Administration's 0.5 ppm 'action level'. In Lake Erie, samples of walleye, drum, white bass, and yellow perch were taken from the eastern, central and western basins and compared for mercury concentration. Walleye from the western basin contained the highest concentration at 1.5 ppm, while drum from the central basin contained the lowest concentration at 0.2 ppm. Tables list several species of fish, ranked on a scale according to the amount of mercury contained in their tissues. A comparison of the contamination of the three lakes was made using yellow perch as a biological indicator. The highest mercury levels were found in Lake St. Clair and the extreme western portion of Lake Erie, while Lake Huron samples showed relatively lower concentrations. (See also W74-06770) (Jerome-Vanderbilt)
W74-06775

MERCURY IN WILD ANIMALS, LAKE ST. CLAIR, 1970,
Bureau of Sport Fisheries and Wildlife, Laurel, Md. Patuxent Wildlife Research Center.
E. H. Dustman, L. F. Stickel, and J. B. Elder.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 46-52, 1972. 3 tab, 6 ref.

Descriptors: *Mercury, *Bioindicators, *Waterfowl, *Path of pollutants, Pollutants, Water pollution, Heavy metals, Biology, Analysis, Analytical techniques, Birds, Reproduction, Data collection, Evaluation, Toxins, Spectrophotometry, Methylation, Atomic absorption spectrophotometry.
Identifiers: *Lake St. Clair.

A preliminary assessment of mercury residues was made for samples of body tissues, eggs and food items removed from the stomachs of water fowl of 4 species, 11 other species of birds, garter snakes and 2 species of frogs taken from the area around Lake St. Clair. Analysis for total mercury was made employing atomic absorption spectrometry with a 'boat modification'. Results, expressed on a wet weight basis, are presented in tables. Mercury residues in many birds appeared to be undesirably high when compared to known harmful amounts. The residues found in tissues of fisheating birds (blue herons and common terns) far exceeded those in other species and were within the range found to be fatal in laboratory experiments. Eggs were found to contain residues of a level considered harmful to reproduction. Since many of these birds are migratory, mercury from Lake St. Clair will find its way to areas far from the source. (See also W74-06770) (Jerome-Vanderbilt)
W74-06776

MERCURY CONTENTS OF BOTTOM SEDIMENTS FROM WISCONSIN RIVERS AND LAKES,
Wisconsin Dept. of Natural Resources, Madison.
J. G. Konrad.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 52-58, 1972. 1 fig, 1 tab, 6 ref.

Descriptors: *Wisconsin, *Mercury, Rivers, *Sediments, *Distribution patterns, Pollutants, Water pollution, Water pollution sources, Heavy metals, Wastes, Industrial wastes, Sampling, Analytical techniques, Bottom sediments, Clays, Sands, Silts, Sewage effluents, Spectrophotometry, Lakes.
Identifiers: *Methylation, Atomic absorption spectrophotometry.

A survey was conducted during the spring of 1970 to determine the location of mercury deposits and elucidate the natural background levels in bottom sediments of lakes and rivers. Samples were collected from 168 locations of 27 rivers and streams which were chosen to reflect discharges of various municipal and industrial wastes and to determine background levels. Flameless atomic absorption analysis was used. Background levels ranged from <0.01 ppm to 0.05 ppm in sandy sediments and from 0.05 ppm to 0.15 ppm in organic and clay sediments. Industrial and municipal systems discharge significant amounts of mercury resulting in high concentrations in some areas; up to 684 ppm in one place. It appears that various water and sediment characteristics, such as pH, control and release of mercury from the bottom sediments. Sludge and effluents from some treatment facilities were also analyzed to determine their contribution to mercury contamination of the environment. The discharge of mercury from a large municipal treatment facility may be as high as 0.5 pounds per day. Public water supplies were found to contain no detectable amounts of mercury. All bottom sediments contain at least a trace of mercury. (See also W74-06770) (Jerome-Vanderbilt)
W74-06777

MERCURY LEVELS IN WISCONSIN FISH,
Wisconsin Dept. of Natural Resources, Madison.
S. J. Kleinert.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 58-70, 1972. 1 fig, 1 tab, 7 ref.

Descriptors: *Mercury, *Path of pollutants, *Fish, *Industrial wastes, *Wisconsin, Pollutants, Water pollution, Water pollution sources, Heavy metals, Walleye, Suckers, Bioindicators, Analytical techniques, Evaluation, Sampling, Spectrophotometry, Sediments, Pulp wastes.
Identifiers: Chor-alkali industry.

A survey was conducted during the spring of 1970 to determine mercury residue levels in fish from a variety of waters in Michigan. Although suckers, goldfish and walleye were the most frequently sampled species, up to 20 different types of fish are included in the survey, representing the population of Wisconsin waters. Determination using atomic absorption spectrometry was done on 1,116 samples representing 2,144 fish taken from 103 locations. Mercury levels in fish taken from water remote from any known source of mercury averaged 0.19 ppm mercury and the values ranged from 0.01 ppm to 0.60 ppm. Different species contained various amounts of mercury and, generally, larger fish had higher concentrations than smaller fish. Fish containing an average of over 0.5 ppm mercury were taken from three areas and public warning was issued for the areas. In general, higher levels of mercury residue were found in fish exposed to waste water discharged from pulp and paper mills and chlor-alkali plants. Mercury is being replaced by a safer substance in the wood processing plants but deposits of mercury in sediments will continue to contaminate for a number of years. (See also W74-06770) (Jerome-Vanderbilt)
W74-06778

MERCURY IN THE LAKE MICHIGAN ENVIRONMENT,
Environmental Research Group, Ann Arbor, Mich.
R. A. Copeland.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 71-76, 1972. 4 fig, 4 ref.

Descriptors: *Mercury, *Plankton, *Sediments, *Lake Michigan, *Distribution patterns, Pollutants, Water pollution, Air pollution, Water pollution sources, Heavy metals, Analysis, Metals, Aquatic microorganisms, Phytoplankton, Zooplankton, Plankton nets, Benthos, Great Lakes, Runoff.

During 1969-70 the Great Lakes Research Division of the University of Michigan established a grid of 21 stations on Lake Michigan, where samples of phytoplankton, zoolplankton, benthos, water and sediments were taken for analysis of 30 elements including mercury. The average value of mercury for phytoplankton was 2.2 ppm, for zooplankton 0.9 ppm and for benthos 1.4 ppm, dry weight. Wet weight values would be approximately 0.44, 0.2, and 0.3 ppm, respectively. As these values were below the 0.5 ppm maximum permissible concentration it appeared that Lake Michigan was still relatively free of mercury contamination. No isolated sources of mercury entering the lake were found. The low concentrations in the southern end of the lake indicated that contamination from airborne mercury resulting from the burning of fossil fuels was negligible. The mercury in the lake was assumed to result from surface runoff as values along the shore are higher than in the center of the lake. (See also W74-06770) (Jerome-Vanderbilt)
W74-06779

INVESTIGATION OF MERCURY CONTAMINATION IN THE TENNESSEE VALLEY REGION,
Tennessee Valley Authority, Chattanooga.
O. M. Derryberry.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 76-79, 1972. 2 fig.

Descriptors: *Mercury, *Data, *Analysis, *Fish, *Tennessee Valley Authority, Pollutants, Water pollution, Water pollution sources, Heavy metals, Metals, Sediments, Management, Reservoirs, Virginia, Alabama, Streams, *Industrial wastes.
Identifiers: Pickwick Reservoir(Ala), North Fork Holston River(Va), Chlor-alkali industry.

Mercury compounds in water resulted in fish-kills in the Tennessee Valley in July 1968 and in the spring of 1969. Action was taken by the Tennessee Valley Authority to analyze samples of fish, water and sediment from 26 reservoirs, and 4 stream reaches. Mercury was found only in Pickwick Reservoir in northern Alabama and the North Fork Holston River in southwest Virginia. Although mercury levels in fish from the Pickwick Reservoir reach 2.4 ppm, the mercury concentration in the water was found to be below the standard of 5.0 ppb proposed by the U.S. Public Health Service. Both areas were closed to fishing. The major sources of mercury in the Tennessee Valley were 3 large caustic-chlorine plants which have taken action to eliminate the mercury discharges. The TVA will continue to monitor the water in that area. Two maps show sampling points and indicate areas of contamination. (See also W74-06770) (Jerome-Vanderbilt)
W74-06780

DISTRIBUTION OF MERCURY IN THE ENVIRONMENT OF MINAMATA BAY AND THE INLAND ARIAKE SEA,
Kumamoto Univ. (Japan). Medical School.
T. Takeuchi.

In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 79-81, 1972. 1 fig, 2 ref.

Descriptors: *Distribution, *Mercury, *Sediments, *Industrial wastes, Pollutants, Water pollution, Water pollution sources, Metals, Heavy metals, Fish, Shellfish, Measurements, Patterns, Evaluation, Crabs, Food chains, Animal pathology, Pathology, Toxins, Crabs, Lobsters.
Identifiers: *Japan(Minamata Bay), Methylation, Poisoning.

In 1959 investigations suggested that mercury was the agent responsible for Minamata disease. The sediments and aquatic life of Minamata Bay were found to have high concentrations of mercury. Sediment from a drainage channel which led to the bay from several chemical plants contained a maximum mercury concentration of 2010 ppm (wet weight). The concentration dropped sharply with distance from the point of discharge, to concentrations of 40 to 59 ppm in the central portion of the bay. At the mouth of the bay which leads to the sea, concentrations were 22 ppm at 1 km and 12 ppm at 1.5 km from the point of discharge. Sediments directly outside Minamata Bay contained only 0.4 to 3.4 ppm Hg. Fish and seafoods caught in the Bay contained from 1 to 36 ppm Hg; the same seafoods outside the Bay in the Shiranue Sea contained from 1-13.5 ppm Hg; and in similar catches in other uncontaminated Japanese waters concentrations never exceeded 1 ppm Hg. (See also W74-06770) (Jerome-Vanderbilt)
W74-06781

MERCURY LEVELS IN A SAMPLE OF MICHIGAN RESIDENTS,
Michigan Dept. of Public Health, Lansing.
K. R. Wilcox, Jr.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 82-85, 1972. 4 tab.

Descriptors: *Mercury, *Food chains, *Public health, Pollutants, Water pollution, Heavy metals, Path of pollutants, Analytical techniques, Bioindicators, Laboratory tests, Pathology, Biochemistry, *Michigan, Great Lakes, Fish, Toxins, Neutron activation analysis, Foods.
Identifiers: *Methylmercury poisoning, *Lake St. Clair.

Twenty-four individuals who frequently ate fish taken from Lake St. Clair were tested for mercury concentrations in their urine with generally negative results. Twenty similar individuals were tested for mercury in their blood. The values, expressed in ng/ml, ranged from 7 to 51.5, with a mean of 17.8. The men had a mean of 22 ppb, while the women had a mean of 12.8 ppb. For the 6 individuals who were still eating fish at the time of the test, the mean was 26.6 ppb while for the 14 who had stopped eating fish two months before, the mean value was only 14.1 ppb. Additional test were performed on samples of hair, showing that there were higher levels of mercury in those persons who had continued to eat fish. The difference in average levels between those who continued to eat fish and those who stopped was consistent with the half-life of excretion of methylmercury. (See also W74-06770) (Jerome-Vanderbilt)
W74-06782

MERCURY IN HUMANS IN THE GREAT LAKES REGION,
Ontario Dept. of Health, Toronto. Environmental Health Services Branch.
E. Mastromatteo, and R. B. Sutherland.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 86-90, 1972, 1 tab.

Descriptors: *Fish, *Public health, *Great Lakes, *Foods, Water pollution, Water pollution sources, Heavy metals, Environmental effects, *Mercury, Human pathology, Bioindicators, Laboratory tests, Paths of pollutants, Biochemistry, Chemical analysis, Neutron activation analysis, Food chains, Canada.
Identifiers: Tolerance levels, Blood, Hair, Urine specimens.

Results from investigations of mercury accumulation in humans are reported. One-hundred-thirty-five residents of the Great Lakes region were tested for mercury concentrations in their urine, with results within the normal range of mercury excretion. Samples of hair, blood and urine as well as histories of fish consumption were taken from 30 individuals in northwestern Ontario. Generally, those who did not eat fish from contaminated waters had the lowest mercury concentration in their hair while those who ate fish from contaminated water had higher concentrations up to 96 ppm, in their hair. The mercury in hair correlated with the number of meals of fish consumed per week. The 9 persons who did not eat contaminated fish had mercury levels below 35 ppb in their blood, while most values for those who ate contaminated fish ranged from 20 to 80 ppb and one individual had a level of 155 ppb. It is believed that the problem of mercury contamination is more widespread than first assessed and that some high concentrations in areas far from industry may result from natural mercury deposits. (See also W74-06770) (Jerome-Vanderbilt)
W74-06783

THE OCCURRENCE OF MERCURY IN THE ENVIRONMENT AND MAN, DISCUSSION PAPER,
Michigan Dept. of Natural Resources, Lansing.
J. Bails, T. W. Clarkson, H. M. Cunningham, W. Fulkerson, and L. Goldwater.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 90-92, 1972, 3 ref.

Descriptors: *Mercury, *Watersheds(Basins), *Diets, Pollutants, Water pollution, Water pollution sources, Heavy metals, Environmental effects, Sediments, Fish, Distribution, Foods, Testing, Analytical techniques, Fossil fuels, Toxicity.
Identifiers: Tolerance level.

Some mercury has been found in sediments throughout the major watersheds of the United States. In places where no industrial sources were evident, as much as 4 ppb mercury were found in the effluents of waste treatment plants. Although methods of detection of mercury are available, there is some question as to the precision of available analytical techniques in assessing low levels of mercury contamination. The average dietary intake of mercury ranges from 5 to 20 micrograms per day. Fish seem to be the major source of dietary mercury. Fruits and vegetables contain mercury at about 20 to 50 ppb, beef and pork contain about 50 to 140 ppb, liver and kidney contain 100 to 200 ppb, and dry milk powders, about 140 ppb (dry weight). Normal cooking procedures do not reduce methylmercury content. Human hair is being used as an indicator of mercury in humans in some studies, and values from 3 to 6 ppb are considered typical for 1970. Some data on the extreme mercury levels in blood and hair in North America are considered to be at the low toxic limit by Swedish investigators, giving cause for concern. (See also W74-06770)
W74-06784

METHODS OF ANALYSIS FOR MERCURY AND ITS COMPOUNDS: A REVIEW,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5A.
W74-06785

PREPARATION OF BIOLOGICAL SAMPLES FOR NEUTRON ACTIVATION ANALYSIS OF MERCURY,
Western New York Nuclear Research Center, Inc., Buffalo.
For primary bibliographic entry see Field 5A.
W74-06786

MERCURY CONTENT OF CANADIAN FOODS AND CEREALS DETERMINED BY DIFFERENT METHODS,
Food and Drug Directorate, Ottawa (Ontario).
For primary bibliographic entry see Field 5A.
W74-06787

A SIMPLE, RAPID METHOD FOR THE DETERMINATION OF TRACE MERCURY IN FISH VIA NEUTRON ACTIVATION ANALYSIS,
Michigan Univ., Ann Arbor. Dept. of Chemistry.
For primary bibliographic entry see Field 5A.
W74-06788

DETERMINATION OF MERCURY BY NON-DESTRUCTIVE NEUTRON ACTIVATION ANALYSIS,
Environmental Research Group, Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W74-06789

DETERMINATION OF MERCURY IN BIOLOGICAL TISSUES,
Environmental Science and Engineering Corp., Nashville, Tenn.
For primary bibliographic entry see Field 5A.
W74-06790

THE DETERMINATION OF ETHYLMERCURY IN BLOOD,
Imperial Chemical Industries, Ltd., Alderly Park (England). Industrial Hygiene Research Lab.
For primary bibliographic entry see Field 5A.
W74-06791

THE DETERMINATION OF MONO- AND DIMETHYLMERCURY COMPOUNDS BY GAS CHROMATOGRAPHY,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 5A.
W74-06792

ANALYTICAL METHODOLOGY FOR MERCURY-DISCUSSION PAPER,
For primary bibliographic entry see Field 5A.
W74-06793

FACTORS IN THE TRANSFORMATION OF MERCURY TO METHYLMERCURY,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
A. Jernelov.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 167-172, 1972, 2 ref.

Descriptors: *Mercury, *Water pollution, Aerobic conditions, Hydrogen ion concentration, Pollutants, Heavvy metals, *Chemical reactions, Aquatic environment, Environmental effects, Sediments, Anaerobic conditions, Microbial degradation, Bacteria, Fungi, Oxidation, Surface waters.
Identifiers: *Methylation, *Methylmercury, *Sweden.

A discussion of the transformation of bivalent inorganic mercury, elemental mercury and phenylmercury into methylmercury and its movement through the aquatic environmental is presented.

The main factors considered are the oxidation of elementary mercury, the methylation of mercuric sulfide, the effects of sediment on the conversion of mercury, the effects of pH, anaerobic and aerobic conditions, and the long term effects of mercury in water. The three major mercury compounds released into the aquatic environment generally move into the sediments first. The oxidation of elemental mercury occurs in most fresh waters, converting it to bivalent mercury. In the sediments the general microbiological activity is related to the methylation of mercury. Methylation in fresh water appears to be higher under low pH, aerobic conditions, but methylation also occurs under anaerobic and higher pH conditions. It seems that mercury remains in sediments and in the aquatic environment long after its introduction. Proposed methods of speeding the recovery of mercury from the environment do not appear feasible at this time. (See also W74-06770) (Jerome-Vanderbilt)
W74-06794

THE ROLE OF FOOD CHAINS IN ENVIRONMENTAL MERCURY CONTAMINATION,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
R. Hartung.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 172-174, 1972. 1 fig.

Descriptors: *Toxins, *Mercury, *Food chains, *Path of pollutants, *Biological communities, Pollutants, Food pyramids, Organic compounds, Inorganic compounds, Transfer, Movement, Stability, Solubility, Public health, Biochemistry.
Identifiers: Methylmercury, Biological half-life.

Although not completely understood, the transport of toxic substances through the food chain is of major concern because those species which occupy the peak, such as predatory animals and man, may receive inordinately high exposure to those substances. The critical analysis of the food chains and their role in the biological dynamics of mercury is complex because of the large number of mercury compounds which occur in the environment under appropriate natural conditions. The basic conceptual components in the concentration of toxicants in the food chain are the absorption routes and efficiency of toxicant travel into the body, the concentration factor of the toxicants in ratio to total body burden, the biological half-life determined from excretion and metabolism, and the ecological community structure which transports the substance. The different mercury compounds (HgS, Hg(++), RHg (+), and RHgR(+) in the environment have different solubilities, stabilities and lipid-water partition coefficients, resulting in different transport characteristics. The analysis of total mercury is an oversimplification of the problem and much more study of the subject is needed. (See also W74-06770) (Jerome-Vanderbilt)
W74-06795

MERCURY AND FOOD CHAINS,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
A. Jernelov.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 174-177, 1972, 1 ref.

Descriptors: *Path of pollutants, *Food chains, *Mercury, *Birds, *Fish, Pollutants, Seed treatment, Animal pathology, Freshwater fish, Pikes, Analysis, Sampling, Data collections, Laboratory tests, Transfer, Water pollution, Aquatic environment.
Identifiers: Methylmercury, Methylation, Whitefish, *Sweden.

Several studies investigating the transport of mercury in food chains and methylation of mercury are reported. Mercury in the feathers of seed-eating birds was measured to find a correlation between those concentrations and mercury content in dressed seed. The feathers contained high amounts until such seed treatment was discontinued in 1965. Since then significant drops in mercury concentration have been reported. A fair correlation between mercury levels in the feathers of fish-eating birds and mercury in fish was observed. A complex study analyzed mercury levels in Northern pike, the contents of their stomachs (usually whitefish) and the contents of the stomachs of those fish (bottom fauna) from contaminated and uncontaminated waters. It was found that a certain amount of mercury results from the diet of the organism and additional mercury is incorporated directly from the water. Another investigation indicated that a certain microorganism present in the surface slime of Northern pike during the late winter and early spring has a high mercury methylation rate. (See also W74-06770) (Jerome-Vanderbilt)
W74-06796

DISTRIBUTION OF MERCURY IN RESIDUAL SOILS,
Colorado School of Mines, Golden. Dept. of Chemistry.
P. B. Trost, and R. E. Bisque.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 178-196, 1972, 6 fig, 9 tab, 14 ref.

Descriptors: *Mercury, *Soil contamination, Soil horizons, Laboratory tests, Pollutants, *Distribution, Soil chemistry, Humic acids, Soil analysis, Sampling, Path of pollutants, Soil properties, Humus, Clays, Measurement, On-site data collections, Evaluation, Solubility, Vapors, *Oregon, *Path of pollutants.
Identifiers: *Residual soils.

A method for the differentiation of vaporous soil mercury and non-vaporous soil mercury by comparison of the mercury content in the organic-rich and clay-rich soil horizons was applied to samples from southwest Oregon. Field samples were analyzed for their mercury and humic acid (i.e., both the humic and fulvic fractions) content and the relative clay distribution was determined. Certain variables affect the distribution of the mercuric ion, Hg (++), and of mercury vapor in residual soils. It appears that humic acid solutions are capable of increasing the solubility of certain mercury compounds. The solubility of cinnabar in organic-rich soil horizons may far surpass its solubility in organic-poor soil horizons. Soil mercury distributions are controlled primarily by humus matter. No correlation was observed between the mercury and clay contents in these soil horizons. Humic-acid-type soil organics also control the distribution of vaporous mercury in soils to a far greater extent than clay. Laboratory studies and field studies are outlined and experimental results are presented. (See also W74-06770) (Jerome-Vanderbilt)
W74-06797

RESEARCH NEEDS: STUDY OF THE ENVIRONMENTAL DYNAMICS OF MERCURY,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
R. Hartung.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 197-198, 1972.

Descriptors: *Research priorities, *Mercury, *Environmental effects, *Food chains, *Path of pollutants, Pollutants, Transfer, Chemical properties, Physical properties, Toxicity, Chemical reactions, Analysis, Evaluation, Water pollution, Human pathology, Organic compounds, Inorganic compounds.
Identifiers: *Mercury pollution, Methylation, Organomercuric compounds.

A brief outline is presented of some of the important studies that are necessary for a clearer understanding of the behavior and effects of environmental mercury. Different mercury compounds must be studied to determine their physical and chemical properties. Air and water transport mechanisms, along with storage and interconversions in sediments and soils need to be investigated in order to understand the complex multiple transport systems in the environment. The methylation processes are of major importance in understanding the toxicological impact of environmental mercury. The behavior of methylmercury and its movement through the food chain must be understood in order to determine the effects of mercury contamination in the environment upon man. (See also W74-06770) (Jerome-Vanderbilt)
W74-06798

ENVIRONMENTAL DYNAMICS OF MERCURY: DISCUSSION PAPER,
Rochester Univ. N. Y.
T. W. Clarkson, A. J. Coble, F. M. D'ltri, J. C. Gage, and L. Goldwater.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 198-201, 1972, 3 ref.

Descriptors: *Mercury, *Ion transport, *Reviews, *Vitamin B, Pollution, Heavy metals, Water pollution, Transfer, Chemical reactions, Aquatic environment, Toxicity, Stability, Solubility, Ions, Inorganic compounds, Organic compounds, Evaluation, Sediments.
Identifiers: *Methylation, Environmental dynamics.

The process of methylation of mercury is examined. Recent studies indicate there may be both nonenzymatic methylation of mercury by methylated vitamin B-12 from bacterial extracts and enzymatic methylation involving the addition of mercuric ions to the sulfhydryl group of cysteine or homocysteine. The sediments would most frequently contain a high proportion of the total mercury in an aquatic system. There are some cases in which the water would contain a high percentage of the total mercury, but rarely, if ever, is it found mainly in the biomass. The methylating process is inhibited by sulfides which join with mercury to form mercuric sulfide. The overall rate of methylation of mercury in the environment is low, requiring the presence of free Hg (++) ion. So far, it has not been possible to differentiate clearly between inorganic and organic mercury in natural aquatic environments. Because some of the present theories of environmental dynamics are based on small samples, more data are needed to form a statistically sound model for mercury transport phenomena. (See also W74-06770) (Jerome-Vanderbilt)
W74-06799

DOSE-RESPONSE RELATIONSHIP ASSOCIATED WITH KNOWN MERCURY ABSORPTION AT LOW DOSE LEVELS OF INORGANIC MERCURY,
Michigan Univ., Ann Arbor. School of Publich Health.
For primary bibliographic entry see Field 5C.
W74-06800

SURFACE ELECTROMYOGRAPHY IN CHRONIC INORGANIC MERCURY INTOXICATION,
Michigan Univ., Ann Arbor. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 5C.
W74-06801

BIOTRANSFORMATION OF ORGANO-MERCURIALS IN MAMMALS,
Rochester Univ., N.Y. Dept. of Radiation Biology; and Rochester Univ., N. Y. Dept. of Biophysics.
For primary bibliographic entry see Field 5C.

W74-06802

THE BINDING OF INORGANIC AND ORGANIC MERCURY COMPOUNDS (HG 203) TO CONSTITUENTS OF NORMAL HUMAN BLOOD,
Creighton Univ., Omaha, Nebr.
For primary bibliographic entry see Field 5C.
W74-06803

BIOLOGICAL REACTIONS AND PATHOLOGICAL CHANGES IN HUMAN BEINGS AND ANIMALS CAUSED BY ORGANIC MERCURY CONTAMINATION,
Kumamoto Univ. (Japan). Medical School.
For primary bibliographic entry see Field 5C.
W74-06804

THE DOSE-RESPONSE RELATIONSHIP RESULTING FROM EXPOSURE TO ALKYL MERCURY COMPOUNDS,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5C.
W74-06805

THE RELATIONSHIP BETWEEN MERCURY CONCENTRATION IN HAIR AND THE ONSET OF MINAMATA DISEASE,
Kumamoto Univ. (Japan). School of Preventive Medicine.
For primary bibliographic entry see Field 5C.
W74-06806

ORGANIC MERCURY POISONING IN ALAMOGORDO, NEW MEXICO,
New York State Dept. of Health, Albany.
For primary bibliographic entry see Field 5C.
W74-06807

SURVIVAL AND REPRODUCTION OF RING-NECKED PHEASANTS CONSUMING TWO MERCURIAL FUNGICIDES,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
For primary bibliographic entry see Field 5C.
W74-06808

DOSE-RESPONSE RELATIONSHIPS AFTER EXPOSURE OF SWINE TO ORGANO-MERCURIAL COMPOUNDS,
Saskatchewan Univ., Saskatoon. Western Coll. of Veterinary Medicine.
For primary bibliographic entry see Field 5C.
W74-06809

DETECTION AND APPRAISAL OF SUBCLINICAL INTOXICATIONS,
Duke Univ. Medical Center, Durham, N.C.
For primary bibliographic entry see Field 5C.
W74-06810

APPROACHES TO THE DETECTION OF SUBCLINICAL MERCURY INTOXICATIONS: EXPERIENCE IN MINAMATA, JAPAN,
Kumamoto Univ. (Japan). Medical School.
For primary bibliographic entry see Field 5C.
W74-06811

MERCURY CONCENTRATIONS IN HUMAN TISSUES AMONG HEAVY FISH EATERS,
New York State Dept. of Health, Albany.
R. F. Korns.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 329-331, 1972. 2 tab.

Descriptors: *Mercury, *Fish, *Diets, *Toxicity, *Public health, Pollutants, Organic compounds, Inorganic compounds, Analytical techniques, Food chains, Measurements, Evaluation, Poisons, Biochemistry, Great Lakes, Water pollution, Spectrophotometry, Fishing.
Identifiers: *Hair, Atomic absorption, Methylation, Spectrophotometry.

Hair from individuals who were known to fish in Great Lakes water was analyzed for mercury by cold vapor atomic absorption. For most of these individuals, the fish represented a substantial and frequent part of their diet. Most of these subjects were Negroes and Puerto Ricans. A total of 22 heavy fish eaters and 7 comparable control subjects were studied. One person was found to have 11.6 ppm mercury in her hair and had eaten fish seven days a week and occasionally twice a day. The average level of mercury in the hair of fish eaters was 3.7 ppm. The average mercury concentration in the hair of the control group was 0.9 ppm. (See also W74-06770) (Jerome-Vanderbilt)
W74-06812

EPIDEMIOLOGICAL APPROACHES TO THE STUDY OF SUBCLINICAL EFFECTS OF MERCURY INTOXICATION,
Michigan Univ., Ann Arbor. School of Public Health.
I. T. T. Higgins.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 331-341, 1972. 1 fig, 3 tab, 4 ref.

Descriptors: *Mercury, *Toxicity, *Surveys, *Human population, *Epidemiology, Pollutants, Poisons, Analytical techniques, Testing procedures, Methodology, Sampling, Population, Ecology, Human pathology, Diseases, Pathology.
Identifiers: *Subclinical effects.

In an epidemiological approach to the investigation of subclinical mercury intoxication the main emphasis is placed on the selection of a population for study and comparison of that population to other groups. Subclinical effects are those which are not obvious but can be detected by careful examination. Most of these symptoms are nonspecific and can not be used for indices of mercury contamination unless rigorous criteria are satisfied. The main criteria are: discrimination, reproducibility, validity, simplicity and acceptability. Each of these criteria is considered in detail. Dose-response relationships must be studied by plotting an estimate of dosage against the proportions of subjects showing the subclinical effect or clinical effects. Occupational groups exposed to mercury and communities living in areas with high levels of environmental mercury are suitable populations for investigations of mercury intoxication. The variation of effects on a given population should be examined and long term implications should be followed and assessed. Any control measures to be instituted on the basis of subclinical investigations should be carefully weighed against ecological considerations. (See also W74-06770) (Jerome-Vanderbilt)
W74-06813

BIOLOGICAL EFFECTS OF MERCURY COMPOUNDS, DISCUSSION PAPER,
Rochester Univ., N. Y.
For primary bibliographic entry see Field 5C.
W74-06814

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE FORT CALHOUN STATION, FORT CALHOUN, NEBRASKA, AUGUST 9-10, 1972.
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W74-06815

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE PALISADES PLANT, SOUTH HAVEN, MICHIGAN, JULY 29, 1970.
EG and G, Inc., Las Vegas Nev.
For primary bibliographic entry see Field 5A.
W74-06816

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE ENRICO FERMI ATOMIC POWER PLANT, MONROE, MICHIGAN, SEPTEMBER 1970.
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W74-06817

THE EXREM III COMPUTER CODE FOR ESTIMATING EXTERNAL RADIATION DOSES TO POPULATIONS FROM ENVIRONMENTAL RELEASES,
Oak Ridge National Lab., Tenn. Radiation Shielding Information Center.
D. K. Trubey, and S. V. Kaye.
Available from NTIS, Springfield, Va., as ORNL-TM-4322; $5.45 in paper copy, $1.45 in microfiche. Report No ORNL-TM-4322, Dec 1973. 85 p, 10 ref, 2 append.

Descriptors: *Radioactivity, Environment, Effluents, Measurement, *Water pollution sources, *Air pollution, *Soil contamination, *Computer programs, Population, Public health, Estimating, Forecasting.
Identifiers: Dose, *Dose rate(Radiation), Dose equivalent rate, Total dose equivalent.

EXREM III is a computer code to estimate the dose equivalent rate and the total dose equivalent from beta, positron, electron, and gamma radiation resulting from submersion in contaminated water, submersion in contaminated air, and exposure to a contaminated surface. There can be more than one environmental release, and exposure can begin at any time after the first release. EXREM III considers contributions from environmental releases and from nuclide decay chains. For a particular problem the user may choose to calculate either dose rates, or the total doses, or both for any of the three modes of exposure. A separate solution array is printed for each mode of exposure. EXREM III is a revised version of EXREM II which was available earlier. The principal revisions include treatment of positron and electron radiations, selection of nuclear data from a data base, variable dimensioning of large data arrays, and free field input. The code is available from the Radiation Shielding Information Center. (Houser-ORNL)
W74-06818

AQUATIC VEGETATION OF THE OTTOWA RIVER NEAR CHALK RIVER NUCLEAR LABORATORIES (CRNL),
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
For primary bibliographic entry see Field 5C.
W74-06819

GEOLOGIC AND HYDROLOGIC BACKGROUND FOR SELECTING SITE OF PILOT-PLANT REPOSITORY FOR RADIOACTIVE WASTE,
Geological Survey, Denver, Colo.
H. Barnes.
Bulletin of the Association of Engineering Geologists, Vol 11, No 1, p 83-92, 1974. 1 fig, 8 ref.

Descriptors: *Survey, Sodium compounds, Sodium chloride, Mining, *Sites, *Rock mechanics, Hydrology, Mine drainage, *Radioactive waste disposal, Geology, Safety, Assessment, Evaluation, Kansas, *New Mexico, Colorado, Utah, Arizona, Louisiana, Gulf Coastal Plains, Waste treatment, Liquids.

The U.S Geological Survey recently completed a series of studies designed to help the Advanced Research Projects Agency and the U.S. Atomic Energy Commission evaluate selected rock types and areas in the United States as potential sites for underground emplacement of noxious or radioactive wastes. The rock types selected were salt and impermeable argillaceous rocks. The areas investigated include the Permian salt basin (especially that part in southeastern New Mexico), the Paradox basin in Utah and Colorado, the Supai salt basin and Luke salt body in Arizona, and the northern Gulf Coast salt-dome province. Of these rock types and areas, the bedded salt deposits of southeastern New Mexico and the Paradox basin seem to be the most promising sites for underground emplacement of noxious or radioactive wastes. (Houser-ORNL)
W74-06820

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED ALVIN W. VOGTLE NUCLEAR PLANT UNITS 1, 2, 3, AND 4.
Directorate of Licensing (AEC), Washington, D. C.
Available from the National Technical Information Service, Springfield, Va., as Docket No. 50424-59; $10.60 per copy, $1.45 microfiche. Report No. Docket 50424-59, 50425-56, 50426-56, and 50427-56, March 1974. 383 p, 46 fig, 44 tab, 138 ref, 12 append.

Descriptors: *Nuclear powerplants, *Effluents, Environment, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis, *Georgia.
Identifiers: *Environmental impact statements, *Pressurized water reactors, *Savannah River(Ga).

This final environmental statement was prepared in compliance with the National Environmental Policy Act. The proposed Alvin W. Vogtle Nuclear Plant would be located on the Georgia side of the Savannah River near the AEC Savannah River Plant. Each of the four units will employ a pressurized water reactor cooled by a closed-cycle cooling system of natural-draft cooling towers using water from the Savannah River. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology including aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion was to issue a construction permit for the facility subject to the following conditions: (1) Monitoring for chlorine as specified; (2) water temperatures controlled within limits specified; (3) follow requirements of discharge water relative to minimizing adverse effects to Beaverdam Creek; (4) follow established procedures during construction and operation to minimize any irreversible damage to the environment. (Houser-ORNL)
W74-06821

A CRITICAL REVIEW OF SOLID RADIOACTIVE WASTE PRACTICES AT NUCLEAR POWER PLANTS,
Oak Ridge National Lab., Tenn.
A. H. Kibbey, and H. W. Godbee.
Available from the National Technical Information Service, Springfield, Va., as ORNL-4924; $5.45 per copy, $1.45 microfiche. Report No. ORNL-4924, March 1974. 70 p, 13 fig, 2 tab, 19 ref, 3 append.

Descriptors: *Nuclear powerplants, *Waste disposal, *Radioactivity, *Reviews, Waste storage, Waste treatment, Liquids, Waste disposal, Assay, Assessment, Census, Transportation, Underground waste disposal, Water pollution, Soil contamination, Water pollution sources.
Identifiers: *Waste burial.

The relationships between solid radioactive waste (radwaste) volume, curie content, and size and number of shipments were studied. These radwaste variables were normalized on the basis of thermal megawatt-hours. All operating light water reactors (LWRs), starting with Dresden Unit 1, were considered from first criticality through December 31, 1972. Plant operating reports and docket materials, supplemented with earlier similar open literature summaries, were the main sources of information. In addition, selected plants known to be planning or undergoing revisions in solid radioactive waste handling procedures were contacted directly. Waste core components were excluded from the analysis because this study was concerned mainly with the trends of routine solid radwaste generated from operation of the liquid waste treatment system. The routine wastes considered in this study are filters, filter sludges, spent demineralizer resins, evaporator concentrates, and dry compressible wastes which are shipped for offsite burial. In the overall analysis, these are grouped together and referred to as total solid radwaste shipped. (Houser-ORNL)
W74-06825

ENVIRONMENTAL SCIENCES DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING SEPTEMBER 30, 1973,
Oak Ridge National Lab., Tenn.
S. I. Auerbach, D. J. Nelson, and E. G. Struxness.
Available from the National Technical Information Service, Springfield, Va., as ORNL-4935; $7.60 per copy, $1.45 microfiche. Report No. ORNL-4935, March 1974. 173 p, 62 fig, 38 tab, 111 ref.

Descriptors: *Environment, *Ecology, *Ecosystems, *Computer programs, *Model studies, Toxicity, Soil contamination effects, Water pollution effects, Absorption, Sorption, Adsorption, Strontium, Plutonium, Food chain, Public health.

Progress is reported in development of computer codes, and model studies concerned with environmental hazards. Waste management studies included mathematical models to follow the movement of water and radionuclides in terrestrial environments. Assessment of environmental impacts of reactor stations is continuing. Behavior patterns, survival, growth, reproduction, and population responses of fish are of major concern. In aquatic ecosystem studies, investigations were carried out in radionuclides cycling, radiation effects, and toxicant formation in condenser cooling systems. Terrestrial radionuclide cycling and effects, toxic materials in the environment, plutonium in mesic and humid environments, and a study of terrestrial and aquatic system interaction are discussed. (Houser-ORNL)
W74-06826

BUFFER CAPACITY IN AQUATIC ECOSYSTEMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
F. G. Pohland, and W. R. Bolton.
Available from the National Technical Information Service as PB-231 469, $3.75 in paper copy, $1.45 in microfiche. Report ERC-0474, March 1974, 43 p, 10 fig, 3 tab, 11 ref, append. OWRR A-033-GA(1). 14-31-0001-3510.

Descriptors: *Hydrogen ion concentration, *Acid-base equilibrium, Water chemistry, Acid streams, *Organic wastes, Organic loading, *Anaerobic conditions, Ecosystems, Ecology, Model studies, Water pollution sources, Water pollution control, *Chemical reactions, Forecasting.
Identifiers: *Buffer capacity, Biological stabilization.

Stream water quality and ecological balance can be substantially affected by pH changes. The change in the pH that one would otherwise expect to be induced by the influx of acidic or alkaline wastes can be significantly reduced by the buffering action of indigenous biochemical reactions. Accurate prediction of the magnitude of induced pH change thus requires information on the strength of the natural buffer system and on its resistance to the effects of various wastes. Analysis of system pH response and buffer capacity was approached through an example of anaerobic biological stabilization of waste organic materials. Simulation of the recognized sequential conversion of complex organic materials through acid production and methane fermentation permitted identification of some of the primary processes and provided a basis for the development of an acid-base equilibrium model reflective of buffer capacity during either normal or distressed conditions. The model can be used to predict the effects of organic wastes on natural aquatic ecosystems and therby provides potentially important input to control the operation of conventional waste treatment processes. Algorithms were developed from the model for iterative solution for pH, buffer capacity, or the adjustment necessary to obtain a desired pH or buffer capacity. The model requires input description of the modeled anaerobic ecosystems that can be determined by explicit or suggestive analysis. The models, computer programs, and example solutions are presented. (James-Georgia)
W74-06829

QUALITY IMPROVEMENT OF FEEDLOT LAGOON WATER BY PERCOLATION THROUGH SOIL UNDER NATIVE PASTURE,
Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 5D.
W74-06830

MODELING AND OPTIMIZATION OF TRANSIENT COOLING WATER DISCHARGE FROM POWER GENERATING PLANTS,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
C. L. Hwang, and L. T. Fan.
Available from the National Technical Information Service as PB-231 354, $3.25 in paper copy, $1.45 in microfiche. Kansas Water Resources Research Institute, Manhattan, Contribution No. 130, December 1973. 33 p, 9 fig, 18 ref. OWRR B-030-KAN(6). 14-31-0001-3592.

Descriptors: *Water quality control, *Optimization, *Thermal pollution, *Regional analysis, *Management, Model studies, Control, *Kansas, Cooling water, Dispersion, Aeration, Waste water treatment, Powerplants.
Identifiers: Thermal pollution control, Water quality models, Optimal control, Regional water quality management.

The present research has yielded a series of publications. They contain the results of: (1) Compilation of water quality data and parameters, and hydrology of Kansas streams and rivers. The compilation could serve as a convenient source of information and should be useful for constructing mathematical models that are relevant to the water quality control and water resource management. (2) The effect of thermal discharge on stream water quality. A modified transient version of the Streeter-Phelps model and of Dobbin's dispersion model along with the energy balance equation is employed to analyze the effects of waste heat discharge from power plants on stream water quality. (3) Water quality control by artificial aera-

tion of stream receiving thermal and organic waste discharges. The location and number of diffuser type aerators to be installed along the stream are determined so as to maintain the stream DO content above a certain minimum requirement. A procedure is also presented for determining the optimal artificial aeration control policy to maintain the water quality. (4) A basin-wide management of water quality of a river which receives thermal and organic wastes. At-source treatment of these pollutants is carried out to control the water quality. (5) Optimal control of cooling water discharge from a power plant. The optimal policy permits a power plant to operate at the highest possible capacity and at the same time to maintain the highest possible water quality.
W74-06832

DISTRIBUTION OF AUTOTROPHIC NITRIFYING BACTERIA IN A POLLUTED STREAM,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
For primary bibliographic entry see Field 5C.
W74-06834

MATHEMATICAL MODEL FOR BARGED OCEAN DISPOSAL OF WASTES,
Tetra Tech, Inc., Pasadena, California.
C. Y. Koh, and Y. C. Chang.
Copy Available from GPO Sup Doc as EP1.23:660/2-73-029, $4.85; microfiche from NTIS as PB-232 018, $1.45. Environmental Protection Agency, Technology Series Report EPA-660/2-73-029, December 1973. 583 p, 29 fig, 14 tab, 68 ref, 2 append. EPA Project 16070FBY.

Descriptors: *Mathematical models, *Waste disposal, Sewage sludge, Liquid wastes, Barges, *Waste dilution, *Dispersion, Computer programs, Model studies, *Settling velocity, Great Lakes.
Identifiers: *Dredge spoils, Ocean dumping, *Ocean disposal.

Theoretical and experimental studies were performed on the dispersion and settling of barge disposed wastes in the ocean. A computer program based on the mathematical model has also been written. Comparison of predictions with experiments, both in this study and from previous investigations were found to be good. Example solutions based on the model for prototype situations are also presented. The waste is assumed to consist of two phases, (1) a solid phase characterized by constituents with various densities and fall velocities, and (2) a liquid phase. The methods of disposal considered include (1) discharge from a bottom a bottom opening hopper barge, (2) pumped discharge through a nozzle under a moving barge, and (3) discharge into the barge wake. The effects of ambient horizontal currents, density stratification, variation of diffusion coefficients are incorporated in the model. Three phases of dispersion are envisioned: (1) a convective phase, (2) a collapse phase, and (3) a long term diffusion phase. Transition between phases is accomplished automatically in the numerical model. In addition, the collapse phase may (a) be replaced by, or (b) include a bottom spreading phase. Under certain circumstances, the collapse phase is bypassed. Every attempt has been made to minimize the amount of input required in the use of the numerical model. Th integration steps and grid sizes are all automatically chosen by the model. Both detailed printout and graphic output are incorporated. The solution may also be terminated at the end of any of the three phases of dispersion. (See also W72-01987) (EPA)
W74-06837

THE RUNOFF OF WATER AND NUTRIENTS FROM WATERSHEDS TRIBUTARY TO CAYUGA LAKE, NEW YORK,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
G. E. Likens.
Available from the National Technical Information Service as PB-231 477, $4.50 in paper copy, $1.45 in microfiche. Technical Report 81, February 1974. 124 p, 47 fig, 34 tab, 20 ref. OWRR A-029-NY(2).

Descriptors: *Lakes, *Watersheds(Basins), *Runoff, *Nutrients, Water chemistry, *New York, Measurement, Water quality, Streams, Sampling, Water analysis, Precipitation, Outlets, Freshwater, Hydrologic data, Statistical methods, Ecosystems, Trophic level, Regression analysis.
Identifiers: *Cayuga Lake(New York).

In June 1970, a detailed study was initiated to measure the water and nutrient inputs for Cayuga and Seneca Lakes via streams and precipitation. Data from the Cayuga Lake watershed are reported herein. The Finger Lakes play a major role in recreation and water supply as well as affect the general economy of the region in a variety of ways. The Cayuga Lake drainage area is described, including geologic, land use, and climatic considerations. Methods and procedures are discussed. Watershed boundaries for each tributary were identified and marked on a map of the Cayuga Lake Basin composited from U.S.G.S. topographic sheets. Streamflow was continuously gauged in only 4 of the major tributaries in the adjacent watershed to Cayuga Lake. Stream velocity was measured with a Gurley Pigmy Current Meter. Regression analysis was made between the continuously gauged streams and the instantaneous measurements from the ungauged streams; generally, the regression with the highest correlation coefficient was used. Streamwater samples were collected either weekly or biweekly by hand or with a non-metallic water sampler. Chemical analyses were made with a Perkin-Elmer Model 403 atomic absorption spectrophotometer. Since continuous, proportional samples were not obtained of runoff, a linear regression analysis was made between discharge and measured nutrient concentration for the monitored tributaries and lake outlet. Study results are discussed in detail. It was found that streamwater chemistry varies considerably throughout the Cayuga Lake Basin. (Bell-Cornell)
W74-06848

WATER AND NUTRIENT BUDGETS FOR CAYUGA LAKE, NEW YORK,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
G. E. Likens.
Available from the National Technical Information Service as PB-231 478 $4.00 in paper copy, $1.45 in microfiche. Technical Report 83, March 1974. 91 p, 10 fig, 45 tab, 61 ref, append. OWRR A-029-NY(3).

Descriptors: *Lakes, Ecosystems, *New York, *Nutrients, Hydrologic aspects, *Trophic level, Watersheds(Basins), Water quality, *Measurement, Precipitation, Streams, Runoff, Outlets, Discharge(Water), Freshwater, Hydrologic data, Statistical methods, Eutrophication, Oligotrophy, Water chemistry, Biological properties.
Identifiers: *Cayuga Lake(New York).

A study initiated in June 1970 to measure the nutrient inputs for Lake Cayuga via streams and precipitation is reported. Hydrologic components including runoff, outlet discharge and lake renewal time, and hydrologic budget are discussed and nutrient budgets are considered. Although light is important, the input and availability of nutrients undoubtedly determines the ultimate trophic status of a freshwater ecosystem. The in situ turnover rate and the flux (direction and rate) of nutrients across the ecosystem's boundaries are of diagnostic value in determining the trophic status of a lake. Quantification of such inputs and outputs for ecosystems may be used to construct budgets and observe balancing mechanisms. Biotic functions within the ecosystem's boundaries are tempered by and respond to these external fluxes. The effect of the natural condition or managed state of the watershed then, in regulating the quantity and quality of drainage outputs (aquatic ecosystem inputs), is vital to this relationship. The studies were undertaken on the Cayuga Lake watershed to measure the nutrient and water inputs and outputs by geologic and meteorologic vectors for the lake ecosystem. (Bell-Cornell)
W74-06849

STORMWATER RUNOFF QUALITY FOR URBAN AND SEMI-URBAN/RURAL WATERSHEDS,
Purdue Univ., Lafayette, Ind. Dept. of Environmental Engineering.
F. T. R. McElroy III, and J. M. Bell.
Available from the National Technical Information Service as PB-231 482 $5.00 in paper copy, $1.45 in microfiche. Purdue University Water Resources Research Center Technical Report No. 43, February 1974. 156 p, 28 fig, 52 tab, 30 ref. OWRR-C-3277(3713)(1).

Descriptors: *Urban runoff, *Storm runoff, *Water quality, *Urban drainage, Coliforms, Biochemical oxygen demand, Suspended solids, Sampling, Watersheds(Basins), Hydrographs, *Indiana, Land use.
Identifiers: Rural runoff, *Pollutographs, Fecal coliforms, *Urban watersheds, *Rural watersheds, *West Lafayette(Ind), Flushing.

Samples of stormwater runoff from an urban and a semi-urban/rural watershed were collected at established gaging-sampling stations. The pollutional characteristics of the runoff for the two watersheds were different. The peak BOD, suspended soils, total coliform and fecal coliform tended to be higher from the urban watershed, but there was considerable range in concentration. A 'first flush' of suspended solids and BOD was exhibited at the urban sampling station while this was not so evident at the semi-urban/rural station. Mass emission pollutographs of BOD and suspended solids showed that the concentration and flow both affected the shape of the pollutograph. The flow hydrograph had a very dramatic effect on the shape and magnitude of the pollutograph. Comparing the two watersheds as to unit 'pounds per day per acre-MGD', the stormwater runoff from the semi-urban/rural watershed had suspended solid and BOD values ranging from .14 to 4.3 lb/day/acre-MGD and from .07 to .14 lb/day/acre-MGD, respectively. The urban watershed had BOD values ranging from 7 to 25 lb/day/acre-MGD and suspended solids ranging from 2 to 8 lb/day/acre-MGD. (Wiersma-Purdue)
W74-06851

A RADIOACTIVE ISOTOPIC CHARACTERIZATION OF THE ENVIRONMENT NEAR WISCASSET, MAINE: A PREOPERATIONAL SURVEY IN THE VICINITY OF THE MAINE YANKEE ATOMIC POWER PLANT,
Maine Univ., Orono. Dept. of Physics.
For primary bibliographic entry see Field 5A.
W74-06855

(RADIATION DATA, SECTION II. WATER).
Office of Radiation Programs, Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-06856

ENVIRONMENTAL ASPECTS OF PLUTONIUM AND OTHER ELEMENTS, A SELECTED ANNOTATED BIBLIOGRAPHY.
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5C.
W74-06857

ON THE SELECTION OF A GROUND DISPOSAL SITE BY SENSITIVITY ANALYSIS,
Kyoto Univ., (Japan). Dept. of Sanitary Engineering.
S. Morisawa, and Y. Inoue.
Health Physics, Vol 26, No 3, p 251-161, March 1974. 4 fig, 6 tab, 21 ref.

Descriptors: *Radioactive waste disposal, Soils, Groundwater, *Radioisotopes, *Migration, *Dispersion, Movement, Safety, Evaluation, Assessment, Sites, Analysis, Ecology, Path of pollutants, Food chains, Public health.
Identifiers: *Dose calculations, Sensitivity analysis.

Disposal of radioactive wastes in the ground is not allowed in Japan at present mainly because of the difficulties in estimating the ground migration of radionuclides and in evaluating the internal dose caused by these wastes. Based on certain assumptions the migration pattern was set down in a previous paper, and the internal dose was estimated. In this paper, the desirable conditions for the ground disposal of radioactive wastes and the approximate method for estimating the internal dose are discussed by means of a sensitivity analysis. Eighteen out of some 26 factors in the three ecological paths through which leaked radionuclides migrate (i.e., drinking water, sea foods and plants) are quantitatively examined by sensitivity analysis. The relationships between the internal dose and the many factors concerned are shown in the tables. The difference between strict calculation and approximation of internal dose is also examined. The approximation is shown to be useful especially for the quick estimation of the safety of a site for the ground disposal of radioactive wastes. (Houser-ORNL)
W74-06858

241-T-106 TANK LEAK INVESTIGATION.
Atlantic Richfield Hanford Co., Richland, Wash.
Available from NTIS, Springfield, Va., as ARH-2874; $4.00 per copy, $1.45 microfiche. Report ARH-2874, Nov 1973. 48 p, 8 fig, 1 tab, 11 ref, append.

Descriptors: *Nuclear wastes, *Water pollution sources, Waste disposal, Water pollution, *Storage tanks, Leakage, Underground storage, *Washington, Seepage, Groundwater movement, Permeability, Soil contamination, Soils, Water table, Assessment, Safety, Evaluation, Public health.
Identifiers: Waste storage, *Hanford site(Wash).

On June 8, 1973, the 241-T-106 underground liquid waste storage tank, located on the U.S. Atomic Energy Commission's Hanford reservation, was confirmed as leaking. It was predicted that the leaked waste would be retained by the dry sediment well above the water table. A study was instigated to confirm this prediction. Results show the deepest penetration was 27 meters below the ground surface or 35 meters above the water table (approximately 87 and 116 feet, respectively). Based on these results and the basic knowledge of liquid movement in Hanford sediments, further movement of the radioactivity from its present location will be negligible. (Houser-ORNL)
W74-06861

BEHAVIOR OF RADIOIODINE IN THE ENVIRONMENT AND IN MAN,
Comitato Nazionale per l'Energia Nucleare, Ispra (Italy). Division Protezione Sanitaria e Controlli.
F. Breuer, and M. DeBortoli.
Available from NTIS, Springfield, Va., as RT/PROT(73)13; $6.25 per copy, $1.45 microfiche. Report CNEN-RT/PROT(73)13, 1973. 80 p, 3 fig, 21 tab, 129 ref.

Descriptors: Iodine, *Iodine radioisotopes, *Environment, *Radioisotopes, Behavior, Ecology, Fallout, Air pollution, Water pollution, Soil contamination, Absorption, Food chains, Human population, Public health, Degradation(Decomposition), Data collections, Aquatic plants, Marine algae.
Identifiers: *Decay, *Half-life.

A collection of data and information is presented for those who have the task of evaluating the consequences of radioiodine releases to the atmosphere. Data and comments are provided: on the physico-chemical state of radioiodine, also in connection with the different sources (fallout and nuclear plants); on the methods for its removal from air; on the mechanisms and parameters of interest in the deposition from air onto vegetation (dry and wet deposition) and the successive depletion; on the radioiodine transfer from grass to milk; on the metabolism in the adult and in the child, from a dynamic point of view and in relation with the stable iodine intake. Finally, the most practically useful data for radiation protection purposes are derived, for chronic as well as for acute contamination situations; for the latter the administration of stable iodine to reduce the dose is also considered. (Houser-ORNL)
W74-06862

GROUND-WATER HYDROLOGY OF NORTHERN NAPA VALLEY, CALIFORNIA,
Geological Survey, Menlo Park, Calif.
For primary bibliographic entry see Field 2F.
W74-06880

MATERIALS INPUT OF LAKE CHAMPLAIN: A SYNOPTIC APPRAISAL,
Vermont Univ., Burlington. Dept. of Zoology.
For primary bibliographic entry see Field 2H.
W74-06882

GROUNDWATER TRACING WITH POST SAMPLING ACTIVATION ANALYSIS,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 2F.
W74-06889

NITRIC OXIDE SORPTION BY CALCAREOUS SOILS: II. EFFECT OF MOISTURE ON CAPACITY, RATE, AND SORPTION PRODUCTS,
Arizona Univ., Tucson. Dept. of Soils, Water and Engineering.
S. Miyamoto, R. J. Prather, and H. L. Bohn.
Soil Science Society of America Proceedings, Vol 38, No 1, p 71-74, January-February 1974. 6 fig, 3 tab, 8 ref.

Descriptors: *Sorption, *Nitrogen, *Waste disposal, Path of pollutants, Air pollutants, Calcareous soils, Soil disposal fields.
Identifiers: *Nitric oxide, *Land disposal(Wastes).

At room temperature, the nitric oxide (NO) sorption capacity of calcareous soils increased with the presence of moisture in an air + NO stream (1.5% NO by volume) and in the soils. The largest increase, up to 10-fold or approximately to the acid-titratable basicity of soils, occurred when NO and H2O were sorbed simultaneously by initially dry soils from a moist air (humidity > 95%) + NO stream. The sorption rates were proportional to the unused portion of the capacity with the rate constants ranging from 0.02 to 0.03 per min for NO and 0.01 to 0.015 per min for H2O under simultaneous sorption. Initially moist soils sorbed NO from a dry air (humidity < 5%) + NO stream until the soils dried. The rate of NO sorption slowed at initial soil water suctions less than approximately 1 bar. Sorbed NO was recovered as nitrate and reacted with the basicity in moist soils. Less than 20% of the sorbed nitrogen was lost upon heating at 105 deg C for 24 hours. (Knapp-USGS)
W74-06894

KINETICS OF THE PHOSPHATE INTERACTION WITH CALCITE,
Utah State Univ., Logan. Dept. of Soil Science and Biometeorology.
R. A. Griffin, and J. J. Jurinak.
Soil Science Society of America Proceedings, Vol 38, No 1, p 75-79, January-February 1974. 6 fig, 1 tab, 19 ref.

Descriptors: *Phosphates, *Calcite, *Sorption, *Adsorption, Thermodynamics, Solubility, Kinetics, Free energy, Soil chemistry, Mineralogy, Water chemistry.

Phosphate interaction with calcite did not proceed in the absence of the calcite surface. The kinetics of interaction could be described by two simultaneous reactions. The first reaction was second-order and was ascribed to the adsorption of phosphate on the calcite surface. The second reaction was first-order and was associated with the surface arrangement of phosphate clusters into calcium phosphate heteronuclei. Solubility criteria show that at low phosphate concentrations the ultimate calcium phosphate surface mineral formed was hydroxylapatite. Desorption kinetics were studied by using an anion exchange resin technique. The desorption process could be described as two simultaneous first-order reactions. The desorption mechanism corresponds to the dissolution of a surface nucleated calcium phosphate mineral, with the second reaction step being the desorption of phosphate from the calcite surface sites. The rate constants for adsorption and desorption were determined at four temperatures between 0 deg C and 40 deg C and were used to compute the activation energies of adsorption and desorption. In addition, the enthalpy of activation, the entropy of activation, and the free energy of activation for both the adsorption and desorption processes were computed. (Knapp-USGS)
W74-06895

AZIDE AND ETHYLENETHIOUREA MOBILITY IN SOILS,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
C. S. Helling, and S. M. Thompson.
Soil Science Society of America Proceedings, Vol 38, No 1, p 80-85, January-February 1974. 2 tab, 27 ref.

Descriptors: *Translocation, *Pesticide kinetics, *Leaching, *Path of pollutants, *Chromatography, Movement, Analytical techniques, Pesticide residues, Soil water movement, Sorption, Herbicides.

Movement of pesticides in soil was studied using a masking technique developed for visualizing non-radioactive compounds on soil thin-layer chromatographic plates. To determine azide mobility, leached plates were sprayed with a kaolinite slurry in 95% ethanol, air-dried, and resprayed with 2% Fe(N03)3 in 5% HN03. The average mobility of azide in four mineral soils was 0.87, and in a muck 0.21; it is thus quite mobile in most soils. The form of azide (NaN3, KN3, or KN3 + K2C03) did not affect mobility. 2-Imidazoli-dinethione (ethylenethiourea, or ETU), a degradation product of ethylenebis (dithiocarbamate) fungicides, was evaluated after masking with kaolinite + alumina (1:2), sprayed onto soil plates in 95% ethanol. Nitroprusside and Grote's reagents were useful chromogenic reagents. Mobility was also determined by autoradiography; average mobilities for four mineral soils ranged from 0.83 to 100, decreasing to 0.61 in a muck. Although weakly adsoebed from solution, ETU is immobilized by drying the soil before leaching. 2-Imadazolidone (ethyleneurea) and possibly sulfur were detected in soil incubated 7 days with ETU. (Knapp-USGS)
W74-06896

NITROGEN MINERALIZATION-WATER RELATIONS IN SOILS,
Agricultural Research Service, Beltsville, Md. Agricultural Environmental Quality Inst.
G. Stanford, and E. Epstein.
Soil Science Society of America Proceedings, Vol 38, No 1, p 103-106, January-February 1974. 3 fig, 1 tab, 8 ref.

Descriptors: *Nitrogen, *Soil chemistry, *Water chemistry, *Soil moisture, Moisture tension, Regression analysis, Porosity, Soil texture, Nitrification, Denitrification, Path of pollutants.
Identifiers: *Mineralization(Soil nitrogen).

The relationships between soil N mineralization, soil water content, and matric suction were studied in nine soils of widely differing chemical and physical properties. Highest N mineralization rates occurred between matric suctions of 1/3 to 0.1 bar, in which range 80% to 90% of the total pore space was filled with water. In the range from optimum soil water content (1/3 to 0.1 bar) to 15 bars, a near-linear relation generally existed between amounts of mineral N accumulated and soil water contents. With increasing dryness, N mineralization continued to decline. Water levels above optimum often reduced mineral N accumulations, presumably because of denitrification. Upon expressing the values for N mineralization (Y) and soil water content (X) for each soil on a relative basis with respect to maximum N mineralized (Y = 100) and associated optimum soil water content (X = 100), the regression of Y on X did not differ among soils. Regression coefficients for common (based on covariance) and total regressions, respectively, were 1.07 and 1.02. Corresponding Y-intercepts were -2 and -4. A reasonable approximation of the regression is Y = X. (Knapp-USGS)
W74-06897

MINERAL NITROGEN MOVEMENT INTO SUBSOILS FOLLOWING CONTINUED ANNUAL FERTILIZATION FOR CORN,
Minnesota Univ., St. Paul. Dept. of Soil Science.
J. M. MacGregor, G. R. Blake, and S. D. Evans.
Soil Science Society of America Proceedings, Vol 38, No 1, p 110-113, January-February 1974. 2 fig, 2 tab, 15 ref.

Descriptors: *Path of pollutants, *Fertilizers, *Nitrates, *Leaching, Nitrification, Dentrification, Ammonia, Nitrogen, Soil water movement, Percolation, Irrigation effects, Tile drainage.

Nitrogen movement was studied in two clay loam soils fertilized in planting for corn (Zea mays L.) for 10 or 15 growing seasons at annual rates of 0, 44.8, or 268.8 kg N/ha. After 10 growing seasons, little NO3-N remained below drainage tile depth in Le Sueur clay loam. After 11 growing seasons on untiled Forman clay loam, considerable NO3-N was found at depths to 6 or 7 meters. After 15 years, appreciable nitrate occurred to the 10-m depth. The average rates of movement of the NO3 front for the 10 and the 15-year periods were 1.7 and 1.9 mm/day, respectively. Concentrations of ammonium N were similar under all fertilizer treatments. Annual N additions failed to significantly increase corn grain yields on Le Sueur clay loam but significantly increased yields on Forman clay loam. (Knapp-USGS)
W74-06898

ESTIMATING SOIL EROSION FROM THE REDISTRIBUTION OF FALLOUT CS-137,
Agricultural Research Service, Oxford, Miss. Sedimentation Lab.
For primary bibliographic entry see Field 2J.
W74-06901

WANDO RIVER ENVIRONMENTAL QUALITY STUDIES, AN INTERIM REPORT.
South Carolina Water Resources Commission, Columbia.
April 1973. 115 p, 17 fig, 6 tab, 11 ref.

Descriptors: *Estuaries, *Water quality, *South Carolina, Environment, Data collections, Hydrologic data, Harbors.
Identifiers: *Wando River(S.C.).

The South Carolina Water Resources Commission designed and conducted an environmental quality study of a portion of the Wando River and an adjacent tract of highland during the period July 1972 through March 1973. The findings are suitable for environmental impact statements for port development in the vicinity of Hobcaw Creek. The Wando River is less turbid and contains less undesirable soluble and sedimentary materials than the other major tributaries of the Charleston Harbor estuary. The quality of water at the mouth of Wando River is significantly affected by flows originating in the Cooper River resulting in a degradation of aquatic conditions. There is a gradual and dramatic improvement of quality upstream in proportion to the distance from Charleston Harbor. Development along the lower reaches will probably not result in additional deterioration to water quality since such conditions already exist. Nor will such developments seriously affect upstream quality providing industrial effluents are nontoxic to marine forms and are otherwise adequately treated. (Knapp-USGS)
W74-06919

DISTRIBUTION OF METALS IN BALTIMORE HARBOR SEDIMENTS,
Environmental Protection Agency, Annapolis, Md. Annapolis Field Office.
O. Villa, Jr., and P. G. Johnson.
Middle Atlantic Region-III Technical Report 59, January 1974. 64 p, 20 fig, 20 tab, 31 ref.

Descriptors: *Heavy metals, *Chesapeake Bay, *Distribution patterns, *Path of pollutants, *Water pollution sources, Bottom sediments, Lead, Copper, Chromium, Cadmium, Zinc, Nickel, Manganese, Mercury, Spectrophotometry, Flame photometry, *Maryland.
Identifiers: *Baltimore Harbor.

In order to develop a current inventory of metals contamination of Baltimore Harbor, sediment samples were collected at 176 stations and analyzed for Pb, Cu, Cr, Cd, Zn, Ni, Mn and Hg using atomic absorption spectrophotometry. Concentration levels were compared with levels found in another highly industrialized harbor complex, other estuarine systems and in Chesapeake Bay sediments geographically removed from the Harbor. Distribution patterns of various metals were related to industrial and municipal inputs. Concentrations of all metals analyzed from the Harbor were about 3 to 50 times greater in value than their counterparts from the Chesapeake Bay. Distribution of metals generally reflected the inputs from the large industrial complex which Baltimore Harbor supports. In black colored sediments mercury, copper, lead and cadmium probably exist as sulfides. Particle size can play a significant role in adsorption reactions of metallic species. Baltimore Harbor and the Chesapeake Bay have generally similar sand, silt and clay ranges, with both averaging about 84% silt and clay. Differences in concentration between the systems were therefore not attributed to variations in particle size. (Knapp-USGS)
W74-06924

ANALYSIS OF IODINE IN ANTARCTIC SNOW,
Nevada Univ., Reno. Desert Research Inst.
M. S. Owens, and J. A. Warburton.
Antarctic Journal, Vol 8, No 6, p 343-344, November-December 1973. 2 fig, 2 ref.

Descriptors: *Iodine, *Precipitation(Atmospheric), *Antarctic, Chemical analysis, Sampling, Neutron activation analysis, Pollutant identification.

Snow collected in Antarctica at Byrd Station in 1969 and 1970, and at Byrd, Siple, and Pole Stations in 1971 and 1972, at depths down to 6 meters, was analyzed for iodine. Analysis is by ion-exchange concentration, followed by neutron activation analysis. Polyethylene bags and containers are a source of iodine contamination of aqueous solutions. In a typical case, water with an initial concentration of less than 5 times 10 to the -13 power grams per milliliter increased to 30 times 10 to the -13 power grams per milliliter after storage in a 20 liter polyethylene bottle for 1 month. (Knapp-USGS)
W74-06929

SILVER CONCENTRATIONS IN ANTARCTIC SNOW AND FIRN,
Nevada Univ., Reno. Desert Research Inst.
For primary bibliographic entry see Field 5A.
W74-06930

GROUND WATER POLLUTION FROM SUBSURFACE EXCAVATIONS: PART II--POLLUTION FROM WELLS.
Water Well Journal, Vol 28, No 4, p 55-56, 58-59, April 1974. 6 tab.

Descriptors: *Water pollution sources, *Water wells, *Waste disposal wells, Excavation, Water pollution control, Path of pollutants, Water quality.

Groundwater pollution often results from subsurface excavations--excavations of all types including water wells. Any time a hole is constructed which provides a possible avenue to bypass the surface filtering system, the chance for pollution is increased. Waste disposal wells are a relatively recent development and are becoming increasingly popular as restrictions on the discharge of noxious and obnoxious fluids to surface waters become more stringent. As of mid-1972 at least 246 such wells had been constructed in the United States. Some of the wastes that are being injected contain chemicals that are relatively toxic and will persist indefinitely in the subsurface environment. Monitoring of the subsurface environment is quite difficult in comparison with monitoring of the surface. If contamination of usable groundwater or other resources should occur, decontamination may be difficult or impossible. (See also W74-06277) (Knapp-USGS)
W74-06933

TRANSFORMATION OF IRON IN A WATERLOGGED SOIL AS INFLUENCED BY REDOX POTENTIAL AND PH,
Louisiana State Univ., Baton Rouge. Dept. of Agronomy.
S. Gotoh, and W. H. Patrick, Jr.
Soil Science Society of America Proceedings, Vol 38, No 1, p 66-71, January-February 1974. 5 fig, 1 tab, 32 ref.

Descriptors: *Iron, *Soil chemistry, *Water chemistry, Oxidation, Hydrogen ion concentration, Reduction(Chemical), Oxidation-reduction potential, Anaerobic conditions.

The distribution of different forms of iron in a waterlogged soil was studied over a wide range of closely controlled redox potential and pH conditions. Increases in water soluble and exchangeable iron were favored by a decrease in both redox potential and pH. The critical redox potentials for iron reduction and consequent dissolution was between +300 mV and +100 mV at pH 6 and 7, and -100 mV at pH 8, while at pH 5 appreciable reduction occurred at +300 mV. The distribution between water soluble and exchangeable iron fractions was highly pH dependent with a decrease in pH at a given redox potential increasing the relative amount of ferrous iron in the soil solution at the expense of that on the exchange complex. A thermodynamic approach to the equilibria

between solid phase ferric oxyhydroxide and a water soluble species of iron (Fe(+2) indicated that it was largely governed by the Fe(+2) - Fe(OH)3 system in which the ferric oxyhydroxide was a mixture of goethite and amorphous material. (Knapp-USGS)
W74-06934

SOLUTE MOVEMENT THROUGH DISTURBED AND UNDISTURBED SOIL CORES,
North Dakota State Univ., Fargo. Dept. of Soils.
D. K. Cassel, T. H. Krueger, F. W. Schroer, and E. B. Norum.
Soil Science Society of America Proceedings, Vol 38, No 1, p 36-40, January-February 1974. 9 fig, 19 ref.

Descriptors: *Solutes, *Translocation, *Soil water movement, *Unsaturated flow, *Path of pollutants, Nitrification, Dispersion, Leaching, Chlorides, Nitrates.
Identifiers: Miscible displacement.

Displacement of nitrate and Cl-36 were measured in disturbed (reconstituted horizon by horizon) and undisturbed soil profiles of Aberdeen loam and Beotia loam representing strong and moderate soil structure, respectively. Each soil core was 30 cm in diameter and at least 80 cm high. Mean water content of the undisturbed soil profile was greater and mean bulk density less than the corresponding values for the disturbed cores for each soil. For example, disturbance increased mean water content by 0.07 for Beotia loam with a 0.01 g/cc decrease in bulk density; disturbing Aberdeen decreased bulk density from 1.47 to 1.30 g/cc but increased mean water content only 0.03. The disturbed soils required greater throughput volume of distilled water to displace the solutes and had smaller dispersion coefficients than the undisturbed soils. For a given effluent sample, relative nitrate concentration was consistently greater than relative Cl-36 concentration due to nitrification occurring within both the disturbed and undisturbed soil profiles during the 24-week period. (Knapp-USGS)
W74-06935

PROCEDINGS NINTH BIENNIAL CONFERENCE ON GROUND WATER.
Water Resources Center University of California, Davis, Cal. 95616. Price $4.00. Conference held Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, December 1973. 154 p.

Descriptors: *Groundwater, *California, *Water resources development, *Water pollution control, Water law, Institutions, Governments, Federal water pollution control act, Regulation, Planning.

The theme of the 9th biennial groundwater conference (California) is a consideration of the growing awareness of factors affecting groundwater quality. Discussed are research findings that relate to quality of water contained in underground aquifers, of water dependent upon a conjunctive or interfacing use between surface water and groundwater aquifers, and related topics concerning activity on the overlying land encompass land-use planning and the consequences for groundwater quality. Operating processes, procedures and programs functioning to use, develop and manage groundwater resources are discussed. Agencies, organizations and individuals involved in the complex array of operating procedures followed in groundwater management present a range of viewpoints to strengthen the basic hypothesis of this conference: that optimal management of groundwater resources requires explicit concern for explicit operational procedures applying to groundwater quality. Institutional settings in which the operating procedures and processes take place with regard to management and use of groundwater resources are considered. Problems encountered by agencies, organizations and individuals charged with the management and decision-making responsibilities relative to groundwater use and development include needs for improved data and reconsideration of laws and operational procedures, better evaluation of total environmental impact, and more consideration of the economic and social consequences of development, use and management of water resource systems. (See W74-06943 thru W74-06956) (Knapp-USGS)
W74-06942

CONJUNCTIVE OPERATION OF SOUTHERN CALIFORNIA GROUND WATER BASINS WITH THE STATE WATER PROJECT,
Southern California Metropolitan Water District, Los Angeles.
For primary bibliographic entry see Field 4B.
W74-06943

GROUND WATER QUALITY MODELS: WHAT THEY CAN AND CANNOT DO,
Water Resources Engineers, Inc., Walnut Creek, Calif.
D. E. Evenson, G. T. Orlob, and T. C. Lyons.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 38-45, December 1973. 10 ref.

Descriptors: *Water quality, *Groundwater, *Mathematical models, Reviews, Simulation analysis, Data collections, Model studies.
Identifiers: *Water quality models.

Groundwater quality models are reviewed. Although at present groundwater quality models have generally been designed to deal with conservative substances, principally the mineral salts, this need not be a real limitation. Soil scientists and agricultural engineers have studied the complex interactions not only between cations and anions in solution, but also between dissolved quality constituents and the soil, and the use of these constituents by crops. Given the quality of infiltrating water and the characteristics of the soil column a model can simulate the quality of water effluent from the soil profile where it enters either the saturated soil column, tile underdrains or an adjacent stream. The primary mechanisms that distribute quality constituents in the saturated portion of the groundwater basin are advection (flow) and dispersion (flow variation). The techniques for formulating realistic models are available and apparently are adequate. What may not be available or adequate is a body of data upon which to build practical quality models of actual systems. Groundwater quality models developed to date, like their counterparts--groundwater quantity models--have been basically two-dimensional, although some crude approximations have been made to account for transport along a third axis. Groundwater basin models have usually been two-dimensional in plan, while sea water intrusion models have been formulated as two-dimensional in profile. Technically, there are no real obstacles to development of a computer program for three-dimensional groundwater quality (or quantity) simulation. Reliable groundwater quality models are strongly dependent upon a capability to describe the movement of groundwater. Quantity and quality models are interactive. The development of groundwater quality models requires processing of data, usually in large amounts. Preliminary development and testing of quality models may provide the first indications of data weaknesses that can be remedied by future action. (See also W74-06942) (Knapp-USGS)
W74-06944

GEOTHERMAL DEVELOPMENT AND SOUTHWEST STORAGE BASINS,
Bureau of Reclamation, Boulder City, Nev. Region 3.
For primary bibliographic entry see Field 4B.
W74-06945

PROTECTING GROUND WATER QUALITY--SOME PROBLEMS AND SOLUTIONS,
Luhdorff (E.E.) Co., Woodland, Calif.
E. E. Luhdorff, Jr.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 53-57, December 1973.

Descriptors: *Water wells, *Public health, *Water pollution control, *California, Regulation, Aquifer testing.

Some areas of well construction are not related to the problems of providing sanitary protection of the well at the surface, but rather to the protection of the groundwater quality of the lower aquifers. One of the major problems in well design and construction is knowing which aquifer should be used in the completion of the well. It is highly desirable to know the quality of water each aquifer contains and ideally its transmissibility, to predetermine how much water will be produced from the well and what its ultimate quality will be. In order to predetermine the conditions which will exist within a completed well, it is advantageous to test individual aquifers in the well before its completion. Regulations are being authored, adopted and administered in California on local levels by a growing number of counties and cities. (See also W74-06942) (Knapp-USGS)
W74-06946

GROUND WATER QUALITY DATA FOR PLANNING, MONITORING AND SURVEILLANCE,
California State Dept. of Water Resources, Sacramento. Div. of Resources Development.
For primary bibliographic entry see Field 5A.
W74-06947

EFFECTS OF SEWAGE DISPOSAL AND RECLAMATION ON GROUND WATER QUALITY,
California State Dept. of Public Health, Sacramento. Environmental Sanitation Div.
For primary bibliographic entry see Field 5D.
W74-06948

EFFECTS OF SOLID WASTE DISPOSAL ON GROUND WATER QUALITY,
L. A. Burch.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 78-84, December 1973.

Descriptors: *Landfills, *Water pollution sources, California, Garbage dumps, Leaching, Biochemical oxygen demand, Heavy metals, Groundwater, Bacteria.

Solid wastes may be the source of several types of water polluting substances. Leachate from refuse may have a BOD as high as 20,000 mg/liter and the COD may be equally as high. Leaching may cause an increase in mineral content of groundwater, as illustrated by major increases in TDS, hardness, chloride, and sulfate. The electrical conductivity may be as high as 25,000 micromhos with chloride concentrations commonly exceeding 2,000 mg/liter. Refuse may contain high densities of coliform, fecal coliform and fecal streptococci organisms and a landfill may provide an ideal habitat for survival and possible regrowth of these organisms; leaching may physically transport such microorganisms out of the landfill. Various organic and inorganic chemicals may be disposed of in a landfill and be present in a discharge from a

landfill. Solid wastes may adversely affect groundwater by two processes--the percolation of leachate and the migration of carbon dioxide gas from the buried solid wastes into the underlying groundwater. The geologic and hydrologic characteristics of a disposal site control the effects that these two processes may have on groundwater quality. Geologic factors include the type of materials underlying a site, their ability to retard the movement of leachate or carbon dioxide to the groundwater, or soil reactions with the percolating waste products. Pertinent hydrologic factors include the position of the groundwater and its proximity to the disposal site and the rate and direction of groundwater movement. (See also W74-06942) (Knapp-USGS)
W74-06949

SLUDGE DISPOSAL TO LAND,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
P. F. Pratt.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 85-93, December 1973. 2 tab, 6 ref.

Descriptors: *Water pollution sources, *Groundwater, *Sludge disposal, *Fertilizers, Nitrates, Heavy metals, Trace elements, Salts, Salinity.
Identifiers: Land disposal(Wastes).

The effects of land use of sludges on groundwater quality depend on the chemical constituents that remain or become soluble and the volume of drainage water that moves from the soil-root system and eventually becomes part of the groundwater. The main problems are nitrates and the soluble cations Ca, Mg, Na and the anions HCO3, SO4 and Cl. If sludges are added at rates adequate to provide the proper amounts of available nitrogen, the available phosphorus requirements of crops will usually be met if not exceeded. However, the reactions of phosphorus with soils and with mineral constituents (calcium, aluminum and iron ions or colloids) in the sludge itself will insure that the phosphorus moves downward very slowly. The only exception would be in sands, in which case the downward migration of phosphorus compounds might be of concern over a long period of time but would still be f at least an order of magnitude slower than the movement of nitrate or chloride. The development of undesirable levels of trace elements in soils as a result of using sludges as a source of nutrients is a slow process and depends on the particular sludge and its rate of use, the soil, and the crops grown. An example of the time involved is provided by the use of liquid digested sludge on agricultural lands in Hertfordshire, England. In this case, the West Hertfordshire Main Drainage Authority has set a tentative limit of no more than 30 years for the use of its sludge. (See also W74-06942) (Knapp-USGS)
W74-06950

AGRICULTURAL WASTES AND GROUND WATER QUALITY,
California Univ., Davis.
R. S. Ayers.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 94-96, December 1973.

Descriptors: *Water pollution sources, *Farm wastes, Leaching, Fertilizers, Groundwater, Water pollution control, *California.

Irrigated agriculture's waste products include salts concentrated by evapotranspiration, residues of fertilizers and soil amendments not picked up by crops, and animal manures from dairy and feed lots. The contamination can be minimized by establishing a favorable balance where export of pollutants balances import, and at a sufficiently low level of pollutant that beneficial uses are not affected. (See also W74-06942) (Knapp-USGS)
W74-06951

THE FEDERAL ROLE AND LEGISLATIVE TRENDS IN CONTROL OF GROUND WATER QUALITY,
Environmental Protection Agency, San Francisco, Calif. Region IX.
For primary bibliographic entry see Field 5G.
W74-06952

CURRENT STATE BOARD ACTIVITIES IN GROUND WATER QUALITY MANAGEMENT,
California State Water Resources Control Board, Scramento.
For primary bibliographic entry see Field 5G.
W74-06953

IMPACT OF WATER POLLUTION CONTROL LEGISLATION ON MEETING FUTURE WATER NEEDS IN CALIFORNIA,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5G.
W74-06954

GROUND WATER POLLUTION--FROM THE WASTE DISCHARGER'S VIEWPOINT,
Gilbert (J.B.) and Associates, Sacramento, Calif.
For primary bibliographic entry see Field 5G.
W74-06955

ENVIRONMENTAL QUALITY: AS AN OBJECTIVE OF GROUND WATER MANAGEMENT,
California State Dept. of Water Resources, Sacramento.
M. H. Remy.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 126-131, December 1973.

Descriptors: *Water pollution control, *Groundwater, *Federal water pollution control act, Monitoring, Regulation, Water quality act, Planning, California, Water law.

Groundwater managers in California can do several things to obtain and impart information needed for wise management of resources. This integration of environmental information into the planning process need not await governmental regulation of the resource. First, much of the basic data on well activities can be obtained from well logs required to be filed under the Water Code. Both diligent enforcement of this filing requirement and increased efforts to make the public aware of such filing requirements will increase the volume and quality of vital data. Secondly, groundwater agencies should make every effort to prepare meaningful and complete environmental impact reports for activities they intend to carry out which might significantly affect the environment. Since groundwater basins are characteristically subject to the assertion of private rights, water resources managers should also begin to use environmental impact reports as a means of communicating with the public. (See also W74-06942) (Knapp-USGS)
W74-06956

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, FLORIDA: PHASE I AREA DESCRIPTION,
National Marine Fisheries Service, St. Petersburg Beach, Fla. Gulf Coast Fisheries Center.
For primary bibliographic entry see Field 2L.
W74-06995

RADIOECOLOGICAL RESEARCHES IN FRESHWATER AND TERRESTRIAL ENVIRONMENT, (IN ITALIAN),
O. Ravera.
Ateneo Parmense Sez Ii Acta Nat. Vol 7, No 1, p 15-25, 1971. (English summary).
Identifiers: Ecological studies, Environment, *Italy(Ispra), Terrestrial environment, *Radioecology, *Research.

The results of 9 yr of radioecological research in Ispra, Italy are reported.--Copyright 1973, Biological Abstracts, Inc.
W74-07009

INFLUENCE OF SOME HYDROLOGICAL PARAMETERS ON CHANGES IN THE RADIOACTIVITY OF THE WATERS OF THE RIVERS CZARNA PRZEMSZA AND PRZEMSZA,
Wojewodzkie Przedsiebiorstwo Wodociagow Kanaliz, Katowice (Poland).
J. Kwapulinski, and T. Zubik.
Acta Hydrobiol. Vol 14, No 3, p 257-271, 1972. Illus.
Identifiers: Hydrological parameters, *Poland(Czarna Przemsza-Przemsza Rivers), *Radioactivity, Rivers, Water level, Water temperature, *Water flow, *Dry residue, Reception basin area.

The influences of some hydrological parameters (water level, water temperature, area of the reception basin, dry residue and water flow) on the specific radioactivity of the water were studied. Based on the studies and the known coefficient of flow changeability and dry residue, the relationship between parameters on any stretch of the river can be established. No correlation between the specific radioactivity of the water and dry residue of flow was found.--Copyright 1973, Biological Abstracts, Inc.
W74-07019

WATER POLLUTION AND BIOLOGY, (IN POLISH),
Polskie Towarzystwo Przyrodnkow im Kopernika, Warsaw.
K. Starmach.
Wszechswiat. 3, p 61-62, 1972.
Identifiers: *Biology, Detergents, Industrial wastes, Pesticides, *Poland, Pollution, Rivers, Sewage, *Water pollution, Effluents.

So-called purified sewage drained into natural water bodies polluted the water. Various types of pollution such as industrial effluents, detergents, commercial fertilizers, pest conrol measures, and others are discussed, and also in some cases the negative influence of mechanical soil cultivation and improper regulation of rivers. Standards for defining the quality of natural water based on biological criteria and strict control of such standards should be established. About 42% of the river waters in Poland are polluted to the point of being unusable.--Copyright 1973, Biological Abstracts, Inc.
W74-07020

DYNAMICS OF CHANGES IN THE CONCENTRATION OF FLUORINE COMPOUNDS EMITTED BY THE PHOSPHORUS FERTILIZER MANUFACTURING ESTABLISHMENT IN POZAN, AND THEIR INFLUENCE ON SURFACE AND UNDERGROUND WATERS AND ON THE ATMOSPHERE WITHIN TH E LIMITS OF THE CITY OF POZNAN, (IN POLISH),
Medical Academy, Poznan (Poland).
A. Jankowiak, Z. Szulczewski, P. Fierek, O. Fiksinska, and L. Pawlak.
Biul Sluzby Sanit Epidemiol Wojewodztwa Katowickiego. Vol 16, No 1, p 95-99. 1972.
Identifiers: Cities, Disposal, Environmental, *Fertilizer manufacture, *Fluorine, *Phosphorus, *Poland(Poznan), Waste waters, *Potable water, Public health, Springs, Well water, *Air pollution.

The concentration of F in drinking water springs in the area studied was lower than optimal values. Well water showed a lower F content than water from municipal waterworks. The phosphorus fertilizer manufacturing establishment was a serious source of air pollution. Filtering installations were not sufficiently efficient in checking infiltration of F into the air. Systematic control of the F content in the air is needed to protect the people living in the vicinity of the factory.--Copyright 1973, Biological Abstracts, Inc.
W74-07021

NITROGEN-FIXING ACTIVITY IN UPLAND AND FLOODED RICE FIELDS,
T. Yoshida, and R. R. Ancajas.
Soil Sci Soc Am Proc. Vol 37, No 1, p 42-46. 1973. Illus.
Identifiers: *Acetylene reduction, Flooded crops, Methodology, *Nitrogen-fixing activity, Oryza-sativa, Paddy fields(Rice), Rhizosphere, *Rice fields.

The acetylene reduction and 15N methods showed that under field conditions of rice (Oryza sativa L.) culture N fixation ranging 3-63 kg/ha occurred in soil, water and the rice plant rhizosphere. The greatest fixation occurred in the rhizosphere and was more pronounced under flooded than under upland conditions. The N fixing activity in flooded soils increased after the panicle initiation stage of the rice plant. It was higher in the planted soil than in the unplanted soil.--Copyright 1973, Biological Abstracts, Inc.
W74-07024

EFFECT OF PLANT GROWTH AND FORM OF NITROGEN FERTILIZER ON DENTRIFICATION FROM FOUR SOUTH AUSTRALIAN SOILS,
Waite Agricultural Research Inst., Glen Osmond (Australia).
For primary bibliographic entry see Field 2G.
W74-07039

DISTRIBUTION AND CIRCULATION OF ARSENIC THROUGH WATER, ORGANISMS AND SEDIMENTS OF LAKE MICHIGAN,
Michigan Univ., Ann Arbor. School of Natural Resources.
I. S. Seydel.
Arch Hydrobiol. Vol 71, No 1, p 17-30. 1972.
Identifiers: *Arsenic, Canada, Circulation, Distribution, *Lake Michigan, *Neutron activation analysis, Organisms, Plankton, Sediments, Water pollution sources, Lakes, Path of pollutants, *Lake Superior, Benthos.

The arsenic water, sediment, plankton and benthos samples from Lake Michigan and Lake Superior (USA, Canada) were measured by means of neutron activation analysis. The samples of Lake Superior served as comparison since Lake Superior is thought to be relatively unpolluted because of low industrialization on the shoreline as well as in the drainage area. Certain geological features of both the lakes suggest that in the natural state Lake Superior should have a higher As content than Lake Michigan. This investigation shows clearly that Lake Michigan has become enriched with As. The high As values of the sediments and the low As values of the water are due to the geochemical behavior of the As. Sources of As are listed.--Copyright 1973, Biological Abstracts, Inc.
W74-07046

5C. Effects Of Pollution

NITROGEN TURNOVER IN IMPOUNDMENTS,
Oklahoma State Univ., Stillwater. Dept. of Zoology.
D. W. Toetz.
Available from the National Technical Information Service as PB-231 199; $4.75 in paper copy, $1.45 in microfiche. Oklahoma Water Resources Research Institute Final Technical Completion Report (1973). 29 p, 5 fig, 8 tab, 8 ref. OWRR A-023-OKLA(2).

Descriptors: Aquatic plants, *Nutrients, Water pollution effects, Ammonia, Impoundments, Model studies, Midges, *Absorption, Rhizomes, Root systems, Isotopes, Leaves, Eutrophication.
Identifiers: *Michaelis-Menton model, *Potemogeton nodosus, *Ceratophyllum, *N-15 isotope.

The relationship between growth of aquatic plants and their nutrient supply is poorly understood. One object was to learn if the Michaelis-Menton model describes the relationship between the uptake of NH4 and the concentration of NH4 in solution. A hyperbola resulted when uptake of NH4 by Ceratophyllum (v) was plotted against the concentration of NH4 in solution (S). Linearity between v and S existed at concentrations less than 7 mg NH4-N(1)-1, suggested that a model for first order saturation kinetics might be appropriate. However, uptake was depressed by one-half at low temperatures and some of the uptake was apparently related to processes which are not completely passive. Another objective was to determine if hydrophytes could absorb ammonia through the root and rhizome system and, subsequently, translocate the absorbed nitrogen to stems and leaves. Uptake and translocation of 15N occurred in three species of hydrophytes. In the laboratory 90% of Potemogeton nodosus tested took up the isotope by roots and rhizomes and approximately 50% had the isotope in stem and leaf organs. Specific uptake rates for plants with enriched parts were highly variable: 0.02 to 40.08 micrograms NH4-N (mg N Root-Rhizome day) -1. Roots, rhizomes, stems and leaves of P. nodosus became enriched with 15N labeled ammonia which had been injected into the lake sediments.
W74-06505

MICRO-ECOSYSTEMS SIMULATION OF PRIMARY PRODUCTION IN THERMAL AND ACID MINE WATER LOADINGS RELATED TO WATER USE OF THE MONONGAHELA RIVER,
West Virginia Univ., Morgantown. Dept. of Biology.
Edward C. Keller, Jr.
Available from the National Technical Information Service as PB-231 234; $9.00 in paper copy, $1.45 in microfiche. West Virginia Water Research Institute, Morgantown, Completion Report, 1973. 442 p, 149 fig, 51 tab, 162 ref, 5 append. OWRR B-001-WVA(4). 14-31-0001-3351.

Descriptors: *Acid mine water, *Primary productivity, Ecosystems, Ecology, Phytoplankton, *Simulation analysis, *Thermal pollution, *West Virginia, *Chlorophyta, Mine water, Water pollution, Water quality, Aquatic microorganisms, Aquatic productivity, Plankton, Heat pollution, Pollution(Thermal), Acidity, Hydrogen ion concentration.
Identifiers: *Monongahela River(W Va), Micro-ecosystems.

Laboratory experiments indicated that the major controlling variables of primary growth and production were pH and total acidity. Buffering systems in the experiments significantly affected total productivity, but river water had very low buffering capacity. Significant modifications occurred in the estimated carrying capacities and general growth characteristics resulting from interactions of the acid mine water, thermal modification, and sewage inputs. Field experiments showed phytoplankter diversity to be significantly affected by acid mine water, there being extremely low diversity in the acid-mine-water feeder streams. Multiple regression analyses on biomass production in the river demonstrated that environmental and chemical variables examined at the Rivesville site were much more predictable than those at Fort Martin. The pH level accounted for 40 percent of the variation at Rivesville. Hardness, calcium, and magnesium were major predictors at Fort Martin, downriver. The total regression model predicted some 70 percent of the variation at Rivesville, only 58 percent at Fort Martin on differential growth analyses; and about 64 percent at Rivesville; and about 40 percent at Fort Martin on the original data.
W74-06507

COLIFORM BACTERIA GROWTH AND CONTROL IN AERATED STABILIZATION BASINS,
Crown Zellerbach Corp., Camas, Wash. Environmental Services Div.
For primary bibliographic entry see Field 5D.
W74-06520

OXIDATION OF ORGANIC MATTER IN SEDIMENTS,
Washington Univ., Seattle. Dept. of Oceanography.
M. M. Pamatmat, R. S. Jones, H. Sanborn, and A. Bhagwat.
Copy available from GPO Sup Doc as EP1.23:660/3-73-005, $1.30 microfiche from NTIS as PB-231 248 $1.45 . Environmental Protection Agency, Ecological Research Series, Report EPA-660/3-73-005, September 1973. 104 p, 24 fig, 12 tab, 48 ref. EPA Project 16070 EKZ.

Descriptors: *Anaerobic conditions, Benthos, Biodegradation, Biochemical oxygen demand, Bottom sediments, Humic acids, *Oxidation, *Oxygen demand, *Organic matter, Pacific Northwest U.S., *Water pollution effects, *Metabolism, *Washington, *Absorption.
Identifiers: Anaerobic metabolism, Dehydrogenase activity(Sediments), Oxygen debt, Metabolic heat release, Microcalorimetry, Lake Washington, Puget Sound, Sediment nutrient release.

Techniques were developed for sampling undisturbed sediment interface, and measuring oxygen uptake by intact sediment cores, dehydrogenase activity of sediment bacteria, and metabolic heat release by benthic organisms. Dehydrogenase activity, a relative measure of anaerobic metabolism, was calibrated by direct microcalorimetry to provide estimates of actual metabolism under field conditions. The oxygen debt of sediments was determined by a dichromate method. Laboratory experiments were conducted to determine the relationship between oxygen uptake, loss of carbon, and release of silicate, nitrate, ammonia, and phosphate by sediments. The oxygen consumption at 33 stations in Puget Sound was measured each season to provide baseline data for this estuary. The original working hypothesis, that total oxygen uptake represents a measure of total metabolism in the sediment column appears erroneous, at least in organically rich sediment where anaerobic metabolism may greatly exceed aerobic metabolism. As sedimentation rate of oxidizable organic matter increases, as in cases of organic pollution and eutrophication, anaerobic metabolism becomes an important process that is measurable by dehydrogenase assay. In less organic sediments, the rate of oxygen uptake may be a fair estimate of total metabolism. Furthermore, it is a useful index of equilibrium conditions among the various factors that affect the rate of oxygen uptake, e.g. oxygen tension, temperature, turbulence, available metabolizable energy, composition of community, etc. (EPA)
W74-06528

PHYTOPLANKTON POPULATIONS IN RELATION TO DIFFERENT TROPHIC LEVELS AT WINNIPESAUKEE LAKE, NEW HAMPSHIRE, U.S.A.,
New Hampshire Univ., Durham. Dept. of Botany.

H. W. Yeo, and A. C. Mathieson.
Available from the National Technical Information Service as PB-231 206 $12.25 in paper copy, $1.45 in microfiche. New Hampshire Water Resources Research Center Completion Research Report No. 9, February 1973. 155 p. 77 fig, 10 tab, 49 ref. OWRR A-019-NH(1).

Descriptors: *Phytoplankton, *Trophic level, New Hampshire, Phosphates, Nitrates, Silicates, Primary productivity, Distribution, Cyanophyta, Eutrophication, Nutrients, Water pollution effects, Indicators, Period of growth, Water temperature, Systematics, Nitrites, Chlorophyta, Diatoms, Chrysophyta, Euglenophyta.
Identifiers: *Winnipesaukee Lake(N.H.), Species diversity, Compound index, Dinophyta, Baccilariophyta, Cryptophyta, Xanthophyta.

The composition, abundance, and seasonal periodicity of phytoplankton at Lake Winnipesaukee, New Hampshire were determined. Eight stations were established to identify their phytoplankton floras and trophic levels. The Chlorophycean species usually dominated each monthly count. Aside from nutrients, the most influential factors affecting algal growth were light, temperature, and organic pollution. Nutrient enrichment experiments were conducted to evaluate their effect on primary productivity of natural phytoplankton populations. Phytoplankton was primarily comprised of Chlorophyceae, Cyanophyceae, Bacillariophyceae, and Chrysophyceae. Cynaophyceae usually dominated the phytoplankton in the number of cells although not in number of species. Different trophic levels appear to exist in the same lake. When applied to the entire lake, the collective indices designated a mesotrophic status to the lake with the Compound Index being the most useful in designating the trophic levels. The three lakes, Winnipesaukee, Newfound and Winnisquam have similar floras except that Winnipesaukee has a far greater number of species. Presence of 45 of the 60 algal genera most tolerant to organic pollution indicates the large impact of organic pollution in Winnipesaukee. Potentially troublesome taxa of algae. Aphanizomenon flos-aquae, Anabaena flos-aquae, Gloeotrichia echinulata, Polycystis aeruginosa, and Anabaena scheremetievi were found throughout the lake. (Jones-Wisconsin)
W74-06529

HYDROBIOLOGICAL STUDIES 3.
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
Academia Publishing House, Prague, Czechoslovakia. 1973. 310p. 127 fig, 64 tab, 267 ref.

Descriptors: *Reservoirs, *Limnology, *Hydrobiology, Radioisotopes, Fertilization, Zooplankton, Carp, Primary productivity, Chemical properties, Physical properties, Mathematical studies, Drainage, Odor, Surveys, Water quality, Eutrophication, Potable water, Statistical methods, Marl, Indiana.
Identifiers: Lipno Reservoir(Czechoslovakia), Vltava Cascade(Czechoslovakia), Dyje River(Czechoslovakia), Klicava Reservoir(Czechoslovakia), Luzicka Nisa(Czechoslovakia), Marl lakes, Bohemia.

Czechoslovak reservoir limnology was studied including the amount of net zooplankton in stations at varying depths, primary production of phytoplankton, and some chemical and physical properties of water in shallow Lipno Reservoir. Temperature, transparency and concentration of some chemical constituents were also investigated in this reservoir. Primary production rates of two series of four interconnected calcareous lakes of northeastern Indiana were studied to ascertain factors controlling low productivity in marl lakes. Comparative experiments were carried out with nitrogen and phosphorus enrichment of small ponds with various breeding stages of carp fry. Effect of mineral fertilizers and fry on plankton development as well as on physics and chemistry of water, was followed in comparative experiments. Annual cycle and seasonal dynamics of zooplankton in backwaters of flooded River Dyje, South Moravia are described, biomass and its changes with regard to individual zooplankton associations determined, and results compared with those from other regions and water types. A survey was made of the water quality of 58 reservoirs in Czechoslovakia; 48 of these are located in the Elbe drainage area and 5 in Luzicka Nisa area. The major factors affecting odor in Klicava Reservoir was found to be anoxic conditions. (See W74-06531 thru W74-06533) (Jones-Wisconsin)
W74-06530

PRODUCTIVITY INVESTIGATIONS OF INTERCONNECTED MARL LAKES (I). THE EIGHT LAKES OF THE OLIVER AND WALTERS CHAINS, NORTHEASTERN INDIANA,
Michigan State Univ., Hickory Corners. W. K. Kellogg Biological Station.
R. G. Wetzel.
In: 'Hydrobiological Studies 3,' Academia Publishing House, Prague, Czechoslovakia, 1973, p 91-143. 19 fig, 7 tab, 41 ref.

Descriptors: *Productivity, *Marl, *Lakes, Indiana, Hardness(Water), Calcium, Cations, Physicochemical properties, Baseline studies, Hydrogen ion concentration, Carbonates, Trophic level, Photosynthesis, Bacteria, Organic matter, Light penetration, Oxygen, Systematics.
Identifiers: Oliver Chain Lakes(Indiana), Walters Chain Lakes(Indiana).

Approximately 15% of northern Indiana lakes are marl lakes, exhibiting high pH, alkalinity, and divalent cations. Causal relationships between low photosynthetic metabolism in marl lakes and regulatory mechanisms influencing primary productivity were investigated. The analysis involved two series of four interconnected marl lakes, each indicating some of the unique characteristics of the trophic ontogeny of marl lakes. Carbon-14 techniques were employed simultaneously from April 1963 through March 1964 to measure in situ rates of primary production. Major physical and chemical characteristics were determined concomitantly. Annual mean rates of primary production in the end basins, both receiving a majority of runoff and containing higher levels of organic matter, were double those of the central lakes. In progression from marl lakes of low production rates to those exhibiting increased productvity within an interconnected series, there exist factors characteristic of calcareous waters that suppress growth. Central among these interactions is the carbonate complex and resultant effects on organic matter and cycling utilization, and indirect complexing function of organic compounds. These effects are eventually counterbalanced, a result of several complex edaphic and morphometric factors, to permit increased sustained rates of production. (See also W74-06530) (Jones-Wisconsin)
W74-06533

UPTAKE OF NATURAL RADIOISOTOPES BY AQUATIC ORGANISMS,
Ceskoslovenska Akademie Ved, Prague. Hydrobiologicka Lab.
J. Justyn.
In: 'Hydrobiological Studies 3, 'Academia Publishing House, Prague, Czechoslovakia, 1973, p 145-171. 18 fig, 3 tab, 40 ref.

Descriptors: *Absorption, *Radioisotopes, *Aquatic populations, Indicators, Radium radioisotopes, Uranium radioisotopes, Potassium radioisotopes, Radioactive wastes, Algae, Plankton, Mosses, Aquatic plants, Mathematical studies, Daphnia, Crustaceans, Cyanophyta, Mollusks, Insects, Fish.
Identifiers: *Natural radioisotopes, Beta activity, Czechoslovak uranium mines.

Under natural conditions in an experimental cascade below the outfall from an abandoned uranium mine and in another 30 localities of surface waters and sources, uptake of radium-226, uranium, gross beta activity and K-40 by aquatic organisms was studied. Also the uptake of radium-226 and gross beta activity was studied in aquatic organisms under laboratory conditions using five types of mine waters from Czechoslovak uranium mines. In general the aquatic organisms proved very good indicators of natural radioactive water contamination. Special attention was given to a plankton mixture of Daphnia and green monocellular algae. Mathematical relation between the natural radioactivity accumulated in various aquatic organisms and in water from their environment was drawn and the possibilities of using this relation as indication of natural radioactive contamination tested. Correlation of contents of Ra-226, uranium, gross beta activity and gross beta activity corrected to K-40, respectively, in ashes of filamentous algae, Bryophyta and other species and in the environmental water was found to represent an exponential function of the radioactive content of water. (See also W74-06530) (Jones-Wisconsin)
W74-06534

THE EFFECT OF MINERAL FERTILIZATION AND OF CARP FRY ON THE COMPOSITION AND DYNAMICS OF PLANKTON,
Vysoka Skola Zemedelska, Lednice (Czechoslovakia). Biological Station.
B. Losos, and J. Hetesa.
In: 'Hydrobiological Studies 3,' Academia Publishing House, Prague, Czechoslovakia, 1973, p 173-217. 16 fig, 4 tab, 51 ref.

Descriptors: *Ponds, *Fertilization, *Fish, *Plankton, *Primary productivity, Nitrogen, Phosphorus, Zooplankton, Daphnia, Copepods, Phytoplankton, Physical properties, Chemical properties, Dynamics, Cyanophyta, Diatoms, Chlorophyta, Rotifers, Crustaceans.
Identifiers: Carp fry.

Comparative experiments were carried out with nitrogen and phosphorus enrichment of small ponds with various stages of carp fry breeding. Effect of mineral fertilizers and fry on development of pond plankton and on physics and chemistry of water was investigated. Significant differences in plankton species composition were ascertained only between ponds with and without the fry, regardless of fertilization type. Various combinations and amounts of fertilizers had no substantial effects on plankton species composition. Only quantitative differences for some species were ascertained between ponds fertilized in different ways. In ponds without fry, water had no vegetation color and transparency was nearly to the bottom (100-150 cm). Species composition of phytoplankton was roughly the same in all ponds without fry. Zooplankton species composition was different in ponds with fry. Soon after stocking, a sudden depression of large cladocerans, Daphnia, was observed. After Daphnia had been consumed by the fry, small carnivorous copepods, Acanthocyclops vernalis, overcrowded. Rate of fry growth was significantly affected by the change of the zooplankton composition. When the fry consumes large Daphnia, its growth curve was steep; when feeding upon small copepods, fish growth slowed. (See also W74-06530) (Jones-Wisconsin)
W74-06535

ANNUAL CYCLE OF ZOOPLANKTON IN BACKWATERS OF THE FLOOD AREA OF THE DYJE,
Brno Univ., Musov (Czechoslovakia). Biological Station.
S. Osmera.
In: 'Hydrobiological Studies 3,' Academia Publishing House, Prague, Czechoslovakia, 1973, p 219-256. 19 fig, 5 tab, 48 ref.

Descriptors: *Cycles, *Zooplankton, *Backwater, *Flood plains, Seasonal, Copepods, Biomass, Crustaceans, Rotifers, Physicochemical properties, Dominant organisms, Annual, Aquatic plants.
Identifiers: *Dyje River (Czechoslovakia).

Zooplankton development is described in four types of backwaters with special regard to typical communities and their characteristic changes throughout the year. Biomass and its changes with regard to individual zooplankton associations were determined and results compared with those from other regions and water types. After an almost uniform amount of Copepoda in the winter, the total zooplankton is washed out during floods. A vernal increase of zooplankton occurs after disconnection of the backwaters. There is a second appearance of Copepoda, the majority of which are replaced later by Cladocera remaining until depression of the flora in the submerged vegetation. In open water areas, Cladocera are replaced by Rotatoria and pelagial species of Copepoda. From early summer, the number of zooplankton decreases. After an overturn until early winter, developmental stages, later even adult specimens of Copepoda, again appear; these persist all winter using the adequate oxygen supply. Nearly all zooplankton disappear in regions with oxygen deficits during the winter, only males of Copepoda and larvae of Chaoborus remaining. The conclusion drawn from a comparison of research is that Crustacea dominate reservoirs containing submersed vegetation while Rotatoria dominate where vegetation is lacking. (See also W74-06530) (Jones-Wisconsin)
W74-06536

SURVEY OF RESERVOIRS IN BOHEMIA AND THEIR WATER QUALITY,
Hydraulic Research Inst., Prague (Czechoslovakia).
V. Rozmajzlova-Rehackova.
In: 'Hydrobiological Studies 3,' Academia Publishing House, Prague, Czechoslovakia, 1973, p 257-282. 15 fig, 2 tab, 10 ref.

Descriptors: *Reservoirs, *Water quality, *Limnology, Water pollution effects, Surveys, Iron, Chemical oxygen demand, Dissolved oxygen, Drainage area, Hydrogen ion concentration, Hardness(Water), Phosphorus, Phytoplankton, Eutrophication, Forests, Plankton.
Identifiers: *Bohemia(Czechoslovakia), Elbe River(Bohemia), Luzicka Nisa(Bohemia).

Survey was made of water quality of 58 reservoirs in Czechoslovakia in 1965; 48 of these are located in the drainage area of the Elbe River and five in the Luzicka Nisa. Sixteen were water supply reservoirs while the remainder served for power production, the supply of industrial and irrigation waters, flood control, or pisciculture and recreation. Hydrogen ion concentration varied between 4.7 and 9.4, with most reservoirs around 7.0. The quantity of planktonic organisms in individual reservoirs varied widely. A typical water-bloom, formed by Aphanizomenon, Anabaena, and Microcystis was found during a single collection of samples only in three reservoirs. No close relationship existed between forested drainage areas and the quantity of phytoplankton in the reservoirs. When the forested percentage of the drainage area was high, total phosphorus in water decreased, but there was a small concentration of phosphorus even when the forested percentage was low. Only reservoirs whose drainage area displayed a low forested percentage showed a high degree of water hardness, while a low degree of hardness was found in reservoirs whose drainage area had a low of high forested percentage. The most polluted reservoir received pulp-mill wastes. (See also W74-06530) (Jones-Wisconsin)
W74-06537

CONTRIBUTION TO THE INVESTIGATION OF ODOURS IN WATER,
Hydraulic Research Inst., Prague (Czechoslovakia).
P. Popovska.
In: 'Hydrobiological Studies 3,' Academia Publishing House, Prague, Czechoslovakia, 1973, p 283-310. 18 fig, 6 tab, 24 ref.

Descriptors: *Odor, *Reservoirs, Dissolved oxygen, Hydrogen ion concentration, Depth, Decomposing organic matter, Statistical methods, Sediments.
Identifiers: Klicava Reservoir(Czechoslovakia).

The odor nuisance was studied in the Czechoslovak Klicava reservoir. Water samples were taken in regular 3-week intervals from January 1965 to August 1966, and odor strength of the water determined in each sample. By statistical methods it was proved that autotrophs (mainly diatoms) are not the primary constituents affecting its organoleptic properties. Using statistical methods it was shown that there is no relation between the quantities of fungi, the manganese bacterium Leptothrix echinata, and the water odor. The relationship between odor strength and pH, odor strength and water depth and odor strength and dissolved oxygen content were proved. No direct proportionality between water temperature and odor strength was found. By multiple linear regression and partial correlation the dependency of the odor on the concentration of dissolved oxygen, to a lesser degree on the water depth (biological processes in the bottom sediments) were found. The effect of pH on odor strength is, according to the results of multiple linear regression and partial correlation, negligible. (See also W74-06530) (Jones-Wisconsin)
W74-06538

SOURCES OF OXYGEN IN ESTUARIES,
M. Owens.
In: Proceedings of Symposium on Mathematical and Hydraulic Modelling of Estuarine Pollution, April 18-19, 1972, Water Pollution Research Laboratory, Stevenage, England, p 25-37. 1 tab, 28 ref.

Descriptors: *Oxygen, *Estuaries, *Advection, Nitrification, Atmosphere, Photosynthesis, Oxygenation, Measurement, Mathematical studies, Flow, Tidal effects, Reaeration, Velocity, Depth, Winds, Wavelengths.
Identifiers: *Oxygen sources, Exchange coefficient.

Sources of oxygen in estuaries are discussed and quantified. During specific periods of investigation, total gain in oxygen in the Thames Estuary from advective sources was about 170 tons/d which was about 18% of that required for complete oxidation of effluents discharged to the estuary. Under certain conditions nitrate and sulphate in the water are reduced by bacterial action and oxygen is directly utilized in oxidizing carbonaceous material, significant in some estuaries. Magnitude of oxygen contribution from the atmosphere is illustrated by considering that for an exchange coefficient of 1 cm/h, 0.24 g oxygen/sq m/d are absorbed for each mg/l deficit. Equations relating to photosynthetic oxygen production and respiration of the algae can be utilized to predict diurnal variations in DO concentration in the water. At certain times of the year freshwater flow, tidal exchange, and reaeration will be the most important sources. Magnitude of the oxygen contribution from the atmosphere is determined amongst other factors) by value of exchange coefficient. Further evaluation, particularly at velocities and depths found in estuaries, is required. Influences of wind speed and wave height on magnitudes of the exchange coefficient need precise defining. (Jones-Wisconsin)
W74-06539

UTILIZATION OF OXYGEN IN ESTUARIES,
Water Pollution Research Lab., Stevenage (England).
M. J. Barrett.
In: Proceedings of Symposium on Mathematical and Hydraulic Modelling of Estuarine Pollution, April 18-19, 1972, Water Pollution Research Laboratory, Stevenage, England, p 39-48. 4 fig, 1 tab, 27 ref.

Descriptors: *Dissolved oxygen, *Estuaries, *Mathematical models, Oxidation, Denitrification, Nitrification, Biochemical oxygen demand, Kinetics.
Identifiers: Thames River(England).

To predict dissolved oxygen distribution in an estuary, the whole course of oxidation up to the time when the remaining unoxidized material escapes through the seaward boundary or is lost by deposition and subsequent dredging must be represented mathematically. Oxidation of carbonaceous and nitrogenous constituents must be distinguished. In the Thames, effluents normally remain within the estuarine system about a month. To utilize BOD test results some means of converting them to 'instantaneous' rates of demand throughout the retention period is necessary. The rate constant increases with increasing temperature. The apparent first odor kinetics commonly found in experiments on oxygen uptake of sewage and other effluents is due to the facts that both a variety of organisms and substrates of differing susceptibilities to degradation are involved, and to the fate of oxygen utilization by respiring bacteria being approximately proportional to the number of organisms present. The course of oxidation of a wide range of wastes could be adequately represented by use of two rate constants. In estuaries nitrogen compounds participate both in oxidation and reduction. Once nitrification begins it continues in water containing low DO concentrations. Nitrate reduction might start under suitable conditions before all traces of DO were absent. (Jones-Wisconsin)
W74-06540

CHANGES IN WATER CHEMISTRY ACCOMPANYING SUMMER FISH KILLS IN SHALLOW EUTROPHIC LAKES OF SOUTHWEST MANITOBA,
Fisheries Research Board of Canada, Winnipeg (Manitoba). Freshwater Inst.
J. Barica.
In: Proceedings of the Symposium on the Lakes of Western Canada, 1973, Edmonton, Ontario, p 228-242. 4 fig, 2 tab, 13 ref.

Descriptors: *Water chemistry, *Lakes, *Fishkill, *Eutrophication, Shallow water, Algae, Dissolved oxygen, Ammonia, Phosphates, Nitrogen, Carbon, Phosphorus, Chlorophyll, Carbon dioxide, Chemical properties, Cyanophyta, Fish farming, Nitrates, Rainbow trout.
Identifiers: *Southwest Manitoba, Aphanizomenon flos-aquae.

Four cases of fishkills following the collapse of heavy Aphanizomenon flos-aquae blooms in shallow eutrophic lakes located in the Erickson area of southwestern Manitoba are described. Emphasis is placed on various chemical parameters in lake water and their changes during the collapse of the bloom and the subsequent fish mortalities. The most dramatic changes in water chemistry take place during the several days prior to the actual fishkill, that is, during the peak of the bloom and during the fishkill itself. Concentration of dissolved oxygen and ammonia undergo the most radical changes. Dissolved oxygen reaches its maximum concentration of 200% saturation or higher right before the fishkill. Concentrations of dissolved oxygen of 20 to 24 mg/l in the surface layers of the lakes are quite common; during this period the Aphanizomenon biomass reaches its maximum. Then, within a few days, a rapid die-off of algae begins and the entire bloom collapses. The

following phase--the actual fishkill--is characterized by a rapid drop of dissolved oxygen from the lake surface down to its bottom, with a simultaneous release of ammonia into the whole profile, without a clear zonation pattern. (Jones-Wisconsin)
W74-06541

OXYGEN IN ESTUARIES: REQUIREMENTS FOR FISHERIES,
Water Pollution Research Lab., Stevenage (England).
J. S. Alabaster.
In: Proceedings of Symposium on Mathematical and Hydraulic Modelling of Estuarine Pollution, April 18-19, 1972, Water Pollution Research Laboratory, Stevenage, England, p 15-23. 1 fig, 3 tab, 23 ref.

Descriptors: *Oxygen, *Estuaries, *Fish populations, *Oxygen sag, Dissolved oxygen, Life cycles, Fecundity, Juvenile growth stage, Larval growth stage, Fish behavior.
Identifiers: River Trent(England).

Sensitivity to low DO concentrations differ between fish species, life stages, and life processes. The DO requirements for fisheries in estuaries must consider this and type of fishery, times and places fish occur, and impact of impairment of each part of the life cycle. Acutely lethal effects would probably be avoided by maintaining DO levels above 3 mg/l though for some species this limit could be lower and for many species lower concentrations could be tolerated for short periods. Sensitivity of salmonid embroyos is greatest at hatching time with high mortalities from sudden exposure to 2-3 mg/l for 6 d. The considerable respiratory and cardiovascular adaptive fish responses to DO changes are not necessarily indicative of impairment of ecologically important functions, and probably should not be used as basis for judgments on DO requirements. Neither reduction in DO to about 5 mg/l nor moderately wide diurnal fluctuations about this level have much effect on growth rate of salmonid alevins. DO reduction to less than 50% saturation can depress juvenile fish food consumption and growth rate. Food resources, swimming performance, behavior, avoidance are all considered. Data given must form basis of DO criteria for fisheries. (Jones-Wisconsin)
W74-06542

CO-OPERATION FOR WATER PROTECTION: EUTROPHICATION CONTROL,
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
G. Dorin.
OECD Observer, No 65, August 1973, p 36-39.

Descriptors: *Water pollution control, *Eutrophication, *Pollution abatement, Nutrients, Monitoring, Sewage effluents, Agriculture, Industries, International commissions, Phosphorus, Nitrogen.
Identifiers: OECD.

Methods of control and monitoring of eutrophication are evaluated. Special attention is given to those substances which act as nutrients, particularly those containing phosphorus or nitrogen, and are often produced by biodegradation of more complex materials. Rapid growth of eutrophication suggests that in the fairly near future a large proportion of surface waters may become affected, in which case the socioeconomic and ecological consequences would be extremely serious. In most cases, phosphorus is the most important element of eutrophication development and the simplest to control. The Organization for Economic Cooperation and Development countries concentrate their efforts on four key points of eutrophication control: detergents containing phosphorus, waste water treatment, pollution by agricultural fertilizers and livestock production, and methods of water monitoring. Over a period of twenty years, eutrophication and the phosphorus concentration in water have largely kept in step with the increased use of detergents containing phosphorus in OECD countries. A significant proportion of sewage treatment plants operate inefficiently. A program is needed to educate farmers to use the best fertilization methods. Technically and commercially the modern management of animal wastes calls for considerable effort. In 1972 international experts drew up a common water measurement system especially designed for eutrophication control. (Jones-Wisconsin)
W74-06543

ABSENCE OF OXYGEN-EVOLVING CAPACITY IN DARK-GROWN CHLORELLA: THE PHOTOACTIVATION OF OXYGEN-EVOLVING CENTERS,
Martin Marietta Labs., Baltimore, Md.
G. M. Cheniae, and I. F. Martin.
Photochemistry and Photobiology, Vol 17, No 6, p 441-459, 1973. 7 fig, 3 tab, 36 ref. AT(11-1)3316.

Descriptors: *Plant morphology, *Chlorella, *Photoactivation, *Photosynthetic oxygen, Cytological studies, Photosynthesis, Manganese, Respiration, Plant pigments, Algae.
Identifiers: *Dark grown, Hill activity.

Studies are described of a light-dependent activation of oxygen evolution of green algae cultured in darkness. Chlorella cells were cultured in darkness and examined for pigment composition, capacity to evolve oxygen and capacity to photooxidize artificial electron donors to Photosystem II and I. From evidence obtained, such cells lack oxygen-evolving centers and the Mn pool associated with such centers but possess fully active System II and I trapping centers. Brief illumination (2-3 min) of dark-grown cells resulted in incorporation of Mn into the oxygen-evolving centers and capacity to evolve oxygen. It is concluded from results of these kinetic studies that the photoactivation of oxygen centers in dark grown Chlorella also is a multi-quantum process involving at least two rate limiting steps and a photosensitive state of limited stability. Measurements of oxygen-yield oscillations indicated that throughout the photoactivation process each newly formed oxygen-yielding center was independent of its neighbors. Photoactivation of the Mn-containing oxygen-yielding catalyst is a fundamental process in all photosynthetic oxygen-evolving tissue. Extrapolation of results would indicate that in development of the photosynthetic apparatus formation of oxygen-yielding sites must be preceded by formation of System II quantum-trapping centers. (Jones-Wisconsin)
W74-06544

STUDIES ON THE PHYTOPLANKTON ECOLOGY OF THE TRONDHEIMSFJORD. I. THE CHEMICAL COMPOSITION OF PHYTOPLANKTON POPULATIONS,
Norges Tekniske Hoegskole, Trondheim. Biological Station.
A. Haug, S. Myklestad, and E. Sakshaug.
Experimental Marine Biology and Ecology, Vol 11, No 1, p 15-26, 1973. 1 fig, 3 tab, 15 ref.

Descriptors: *Physiological ecology, *Chemical properties, *Phytoplankton, Proteins, Lipids, Phosphorus, Nitrogen, Dinoflagellates, Diatoms, Cytological studies, Analytical techniques, Carbohydrates.
Identifiers: *Trondheimsfjord(Norway), Chaetoceros affinis, Skeletonema.

Using observations of Chaetoceros affinis as a basis, changes in chemical composition of natural phytoplankton populations, particularly the changes in the amounts of the different carbohydrate fractions were studied in the hope that these changes may provide valuable information about the ecology of the phytoplankton in Trondheimsfjord, Norway. Samples of phytoplankton populations were analyzed for carbohydrate, protein, lipid, and phosphorus. Lipid was less than 10% of the organic dry matter. The N/P ratio was remarkably constant, but the ratio protein/carbohydrate varied between wide limits. For samples consisting mainly of dinoflagellates, the protein/carbohydrate ratio was always low, due to a large amount of insoluble polysaccharides. For diatoms, the carbohydrates may be divided into three fractions. The amounts of acid-soluble glucan varied from 7.7 to 36.5% of organic dry matter and these changes are the main cause of the variation in the protein/carbohydrate ratio of diatom samples. For diatom samples this ratio is a valuable indicator of the physiological state of the population. The gas-chromatographic investigation of the monosaccharide composition of the soluble carbohydrates also reveals a significant difference between dinoflagellates and diatoms. (Jones-Wisconsin)
W74-06545

THE EFFECTS OF ECOLOGICAL CHANGES ON BUCKEYE LAKE, OHIO, WITH EMPHASIS ON LARGEMOUTH BASS AND AQUATIC VASCULAR PLANTS,
Bureau of Sport Fisheries and Wildlife, Washington, D.C.
J. B. Judd, and S. H. Taub.
Ohio Biological Survey, Biological Notes No 6, 1973. 6 fig, 17 tab, 61 ref, append.

Descriptors: *Ecology, *Reservoirs, *Aquatic plants, *Ohio, *Bass, Systematics, Limnology, Turbidity, Fish behavior, Sport fish, Fish diets, Fish populations, Growth rates, Fish reproduction, Fish parasites.
Identifiers: *Largemouth bass, *Buckeye Lake(Ohio).

Evaluation of the present condition of Buckeye Lake in Ohio involved an analysis of age and growth structure of the largemouth bass population, a qualitative and quantitative survey of the higher aquatic plants, collection of physical and chemical parameters, and determination of the parasitic infections of the largemouth bass. Since its construction in 1826, Buckeye Lake has undergone ecological changes resulting in changes in status of the largemouth bass; it supported fewer but larger bass in 1970 than in the past, however, with a faster growth rate. The bass are not noticeably affected in growth or reproduction by interspecific competition from other fishes; they support a typical parasitic fauna, Proteocephalus ambloplitis, which does not appear to be a limiting factor. The lake's reduced capacity to support the comparatively large number of largemouth bass present in the late 1800's and early 1900's is due to the decrease in extent and number of higher aquatic plant species and removal of stumps, logs, and debris. Since 1930, the lake has become more eutrophic according to limnological measurements. Decrease of aquatic vegetation, bottom clearing with consequent increased wave action, plankton propagation have increased turbidity. (Jones-Wisconsin)
W74-06546

ENDOGENOUS AND PHOTOPERIODIC DIURNAL RHYTHMS OF IN VIVO LIGHT ABSORPTION AND SCATTERING IN THE GREEN ALGA ULVA LACTUCA L.,
Johns Hopkins Univ., Baltimore, Md. McCollum-Pratt Inst.; and Johns Hopkins Univ., Baltimore, Md. Dept. of Biology.
S. J. Britz, and H. H. Seliger.
Biological Bulletin, Vol 144, No 1, p 12-18, 1973. 2 fig, 11 ref.

Descriptors: *Plant physiology, *Biorthyms, *Light, Chlorophyta, Photoactivation, Absorption, Photosynthesis, Wavelengths, Algae, Maryland.
Identifiers: Light scattering, Patuxent River(Maryland).

It had been observed that in the in vivo visible light absorption spectra of Ulva lactuca, the absorbance varied considerably over time at all wavelengths in a seemingly rhythmic pattern. Free floating specimens of Ulva lactuca were collected along the shore near the mouth of the Patuxent River, Maryland and cultured in the laboratory. At all wavelengths relative optical density values varied rhythmically with periods of 24 hours. The presence of these rhythms of light absorption and scattering in artificial nutrient medium under constant photoperiod was demonstrated with in vivo spectroscopy. The absorbance during photophase at 682 nm, the chlorophyll-a in vivo absorption maximum, was typically two to three times that during scotophase. Prephased endogenous rhythms (in continued darkness) were observed for a time period equal to three photoperiods. The absorbance rhythm did not correlate with changes in extractable chlorophyll-a or -b concentration. No changes in linear dichroism were observed, indicating the rhythm of light absorption could not be explained on the basis of orientation of individual absorber molecules. In vivo light microscopy did not reveal differences in chloroplast orientation. (Jones-Wisconsin)
W74-06547

THE INFLUENCE OF ENVIRONMENTAL FACTORS ON THE DISTRIBUTION OF FRESHWATER ALGAE: AN EXPERIMENTAL STUDY. III. EFFECTS OF TEMPERATURE, VITAMIN REQUIREMENTS AND INORGANIC NITROGEN COMPOUNDS ON GROWTH,
Michigan State Univ., East Lansing. Dept. of Botany.
B. Moss.
Journal of Ecology, Vol 61, No 1, p 179-192, 1973. 6 fig, 3 tab, 48 ref.

Descriptors: *Algae, *Temperature, *Vitamins, *Growth rates, Nitrogen compounds, Inorganic compounds, Distribution, Phosphorus, Ammonia, Nitrates, Chlorophyta.
Identifiers: Eutrophic algae, Oligotrophic algae.

Algal growth was determined at several temperatures under otherwise standard conditions, since temperature optima for growth varies markedly with species, in order to investigate whether oligotrophic species in general might have intrinsically lower growth rates than eutrophic algae. Effect of vitamin availability and ability to use nitrate by the eutrophic and oligotrophic flora was studied. Experiments to determine growth rate were carried out in constant temperature water baths fitted with heaters and refrigeration units. Species tested were: oligotrophic group--Micrasterias americana, Pleurotaenium trabecula, Cosmarium, Gonatozygon monotaenium, Roya anglica, and Desmidium swartzii; eutrophic group--Pandorina morum, Cosmarium botrytis, Closterium acerosum, Volvox aureus, Eudorina californica, Haematococcus droebakensis, Mesotaenium kramstai, Scenedesmus quadricuada, and Pediastrum duplex. The maximum growth rates of oligotrophic species tended to be smaller than those of eutrophic species. Temperature optima for growth under the conditions used did not differ between the two groups. Possible adaptive advantages of low growth rates in infertile waters are discussed in relation to theoretical generalization on the maturity of ecosystems. Some members of both groups required vitamin B-12 for growth, and most species tested could use either nitrate or ammonium as a nitrogen source. (Jones-Wisconsin)
W74-06549

EPIPHYTIC MICROPHYTES IN A POND POLLUTED WITH BEET SUGAR FACTORY WASTES,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
W. Huk.
Acta Hydrobiologica, Vol 15, No 1, p 89-95, 1973. 1 fig, 1 tab, 8 ref.

Descriptors: *Periphyton, *Microorganisms, *Sewage lagoons, *Algae, Industrial wastes, Anaerobic conditions, Systematics, Cyanophyta, Euglenophyta, Chrysophyta, Chlorophyta, Protozoa, Biochemical oxygen demand, Self-purification, Organic matter, Sugar beets.
Identifiers: *Sugar factory wastes, Bacteriophyta, Epiphytes.

Observations of epiphyte development were conducted on a specially prepared synthetic medium in a pond filled with undiluted beet sugar factory wastes. The medium consisted of bunches of narrow cellophane strips 15 cm long and 1 mm wide hung at 30 cm depth in two points in the pond. The collected material showed 62 systemic units, including Bacteriophyta, Cyanophyta, Euglenophyta, Chrysophyta, Chlorophyta, and Protozoa, of which only 22 units had been previously recorded. During the first two months after the beet sugar factory wastes had been released into the pond, water in the pond was navy blue and smelled putrid and contained poorly developed periphyton covering only part of the strips. When the color changed, the periphyton composition was much more varied; then great decrease of BOD-5 and the absence of dissolved oxygen indicated the existence of very intensive reductive-oxygenating processes. During the course of six months, full mineralization of the wastes released into the pond took place, with various organism communities participating. Individual states of self-purification of the wastes were clearly reflected in the composition of the periphyton species as well as in their abundance. (Jones-Wisconsin)
W74-06551

PROTOZOANS IN PONDS FILLED WITH SUGAR FACTORY WASTES,
Polish Academy of Sciences, Krakow. Zaklad Biologii Wod.
E. Grabacka.
Acta Hydrobiologica, Vol 15, No 1, p 97-111, 1973. 2 fig, 3 tab, 11 ref.

Descriptors: *Protozoa, *Sewage lagoons, *Industrial wastes, Bottom sediments, Fish farming, Self-purification, Benthos, Systematics, Dissolved oxygen, Anaerobic conditions, Organic matter, Bacteria.
Identifiers: *Sugar factory wastes, Golysz Experimental Farms(Poland), Metazoa, Ciliata, Heliozoa, Rhizopoda, Metopidae, Oxytrichidae.

Purification of sugar factory wastes is difficult because great quantities of sewage with high organic matter are produced in a short period. Purification was attempted by utilizing the wastes in fish ponds, where they are gradually mineralized, enriching the water with new nutrient compounds. Succession of protozoans in bottom sediments during the self-purification process was studied and the changes effected in the bottom microfauna by introduction of different waste concentrations from the sugar production process investigated, specifically the Ciliata group, of which many species are fairly sensitive indices of the degree of water pollution and hence reflect the course of self-purification. Self-purification was distinctly reflected in the development of Ciliata on the bottom, successively manifested in three ecologically different Ciliata associations. Strong pollution at the beginning of the experiment resulted in unfavorable conditions for protozoans. Enrichment of the pond with new mineral constituents favorably influenced increase in number of Ciliata. Ciliata numbers in ponds filled with undiluted of weakly diluted wastes were many times higher than in normally utilized ponds. No influence of wastes on the bottom microfauna of protozoans in the second year was found. (Jones-Wisconsin)
W74-06552

MACROBENTHOS OF PONDS WITH SUGAR FACTORY WASTES,
Polish Academy of Science, Krakow. Zaklad Biologii Wod.
J. Zieba.
Acta Hydrobiologica, Vol 15, No 1, p 113-129, 1973. 5 fig, 1 tab, 25 ref.

Descriptors: *Benthic fauna, *Ponds, *Industrial wastes, *Sewage lagoons, Diptera, Larvae, Biochemical oxygen demand, Fish farming, Benthos, Phytoplankton, Fish food organisms, Anaerobic conditions, Carp, Eutrophication, Biomass, Oligochaetes.
Identifiers: *Sugar factory wastes, Chironomidae, Glyptotendipes polytomus, Ciliata, Golysz Experimental Farms(Poland).

In purification of sugar factory wastes in fish ponds, biological productivity gradually increases as expressed by intensive development of bottom fauna. Metabolism of the dominant species of this fauna was considered for understanding of their ecological dependencies and consequently to a more satisfactory utilization of the wastes treated in the ponds. Results of a preliminary two-year investigation of macrobenthos are presented. Seasonal fluctuations in numbers and biomass of the macrobenthos fauna were related to trophic conditions dependent on different concentrations of sugar factory wastes. In ponds with undiluted and greatly diluted wastes, development of benthic fauna--mainly of Chironomidae larvae--occurred in a specific pattern. With no waste dilution a new generation of the fauna was more than two months behind as compared with the pond with diluted wastes. Conclusions are that presence of large amounts of macrobenthos in the first vegetation period after the inflow of wastes can provide considerable food reserves for larger stocks of reared carp. Wastes should not be too concentrated; otherwise the development of macrobenthos is inhibited and fish stocking is possible only in the second half of the summer. (Jones-Wisconsin)
W74-06553

REPORT OF THE EXPERT GROUP ON DETERGENTS.
Organization for Economic Co-Operation and Development, Paris (France). Directorate for the Environment.
Report 89769, 1973. 40 p, 1 fig, 3 tab, 2 append.

Descriptors: *Detergents, *Eutrophication, *Legislation, *Phosphates, Social aspects, Formulation, Social impact, Hazards, Laundering, Sewage treatment, Costs, Sodium compounds, Heavy metals, Economics.
Identifiers: *OECD, Sodium triphosphate, Ethylenediaminetetraacetic acid, Polycarboxylic acids, Hydroxycarboxylic acids, Polymers, Soaps, Sodium carbonate, Sodium silicate, Sodium nitrilotriacetate, NTA, EDTA.

Steps already taken by various OECD countries to control detergents affecting eutrophication are reported. Information was collected on detergent consumption and its trends, both in composition and quantity. Potential consequences, including economic, of proposed substitutes and their constituents are assessed. Basic considerations are presented concerning present national policies regarding the formulation of detergents with special reference to phosphate builders and to possible substitute materials in connection with existing or proposed legislation (national, federal, regional) and of voluntary agreements regarding the constituents of detergents which may affect eutrophication. Requirements of detergent performance are discussed and qualifications of substitutes for detergent phosphates including NTA, EDTA, polycarboxylic acids (citrates), hydroxycarboxylic acids, polymers, soap and soap-phosphate combinations, and sodium carbonate and sodium silicates with their prerequisite requirements for compatibility with the current types of textiles.

Cost associated with alternative policies are given. Appropriate enforcement policies should be promulgated to particular regional conditions. Research is in progress on NTA removability in water and sewage treatment processes, the carrying of heavy metals as soluble complex ions through sewage treatment processes into surface and ground waters, and on health effects. (Jones-Wisconsin)
W74-06554

A STUDY OF HAZARDOUS WASTE MATERIALS, HAZARDOUS EFFECTS AND DISPOSAL METHODS. VOLUME I.
Booz-Allen Applied Research, Inc., Bethesda, Md.
Available from the National Technical Information Service as PB-221 465. National Environmental Research Center, Cincinnati, Ohio, Final Report EPA-670/2-73-14, July 1973. 389 p, 8 fig, 81 tab, 873 ref. 68-03-0032.

Descriptors: *Hazards, *Industrial wastes, *Waste disposal, Water pollution, Costs, Information retrieval, Bibliographies, Solid wastes, Industries, Mining, Waste treatment, Radioactive wastes, Toxicity, Waste dumps, Food processing industry, Textiles, Pulp and paper industry, Chemical wastes, Oil industry, Metals, Waste identification, Soil contamination, Air pollution, Environmental effects, Chemical warfare, Explosives, Thermal powerplants, Waste water treatment, Injection wells, Control, Tannery wastes.
Identifiers: *Hazardous materials, Waste streams.

Background information is presented by providing a list of hazardous materials which should be subject to special disposal techniques, documentation of harmful effects now known and provisions for mechanisms for revising these harmful effects, develop a rating system for delineating the degree of hazard, and provide an inventory of current disposal practices and evaluation of these practices. Hazardous waste materials are defined as materials or combination of materials which require special management techniques because of their acute or chronic effects on biological health and the environment. An extensive literature search was conducted which included both manual and computer screening of pertinent literature sources. The industrial groups are identified with detailed information on the composition of industrial waste streams. The more pressing problem of hazardous wastes occurs as a result of production and use processes. Compounds found hazardous are tabulated into a rating system. A survey and inventory of treatment and disposal methods are presented. Major findings and conclusions are grouped under definition of hazardous wastes and identification of hazardous effects, selection and rating of hazardous materials, quantification and distribution, waste treatment processes, and national disposal systems. Recommendations and a bibliography are included. (See also W74-06556 and W74-06557) (Jones-Wisconsin)
W74-06555

A STUDY OF HAZARDOUS WASTE MATERIALS, HAZARDOUS EFFECTS AND DISPOSAL METHODS. VOLUME II.
Booz-Allen Applied Research, Inc., Bethesda, Md.
Available from the National Technical Information Service as PB-221 466. National Environmental Research Center, Cincinnati, Ohio, Final Report EPA-670/2-73-15, July 1973. 525 p, 20 fig, 89 tab, 61 ref. 68-03-0032.

Descriptors: *Hazards, *Industrial wastes, *Waste disposal, Mining, Coals, Bituminous materials, Food processing industry, Pulp and paper industry, Chemical wastes, Plastics, Resins, Elastomers, Soaps, Detergents, Paints, Explosives, Fertilizers, Pesticides, Textiles, Synthetic rubber.
Identifiers: Metals, Drugs, Varnishes, Lacquers, Enamels, Perfumes, Cosmetics.

A compilation of wastes generated by the food processing industry; textile mill products; paper and allied products; chemicals and allied products (including industrial organic chemicals and industrial inorganic chemicals); plastic materials and synthetic resins, synthetic rubber, synthetic and other manmade fibers; drugs; soap, detergents, cleansers, perfumes, cosmetics and other toilet preparations; paints, varnishes, lacquers, enamels, and allied products; agricultural chemicals, including chemical fertilizers and pesticides; and commercial and military explosives including liquid and solid rocket propellants, is given. Industry description, production statistics, economic statistics, waste characteristics, waste disposal and waste treatment processes and practices are described, including disposal hazards. (See also W74-06555) (Auen-Wisconsin)
W74-06556

A STUDY OF HAZARDOUS WASTE MATERIALS, HAZARDOUS EFFECTS AND DISPOSAL METHODS. VOLUME III.
Booz-Allen Applied Research, Inc., Bethesda, Md.
Available from the National Technical Information Service as PB-221 467. National Environmental Research Center, Cincinnati, Ohio, Final Report EPA-670-2-73-16, July 1973. 444 p, 15 fig, 85 tab, 70 ref. 68-03-0032.

Descriptors: *Hazards, *Industrial wastes, *Waste disposal, Statistics, Oil industry, Radioactive wastes, Industries, Economics, Tannery wastes, Air pollution, Water pollution, Nuclear powerplants, Powerplants, Solid wastes, Thermal pollution.
Identifiers: Leather industry, Asbestos industry, Department of Defense, Fabricated metals industry, Hospitals, Medical services, Steel industry, Nonferrous metals industry, Metals finishing, Nuclear powered ships.

A compilation of hazardous wastes generated by the following industries is given: The petroleum and coal products industry; leather tanning and finishing; abrasives, asbestos and miscellaneous nonmetallic mineral products; blast furnaces, steel works, and rolling and finishing mills; primary smelting and refining of nonferrous metals; coating, engraving and allied services of fabricated metals; nuclear power production; hospitals; and conventional power utilities. Included are listings of hazardous materials, their rating and supporting data. Industry description, economic statistics, production processes, waste materials, waste disposal processes and practices for each industry, as well as hazardous effects of wastes and impact of wastes on water quality are presented. Usage of coal, petroleum, natural gas, uranium and geothermal power by utilities and associated environmental pollution are detailed. Disposal of radioactive wastes for Naval nuclear-powered ships and their support facilities and a summation of their environmental monitoring is given. A comprehensive listing of hazardous materials and compounds found hazardous by a rating system is included. (See also W74-06555) (Auen-Wisconsin)
W74-06557

FRESHWATER BIOLOGY AND POLLUTION ECOLOGY: TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
For primary bibliographic entry see Field 5A.
W74-06558

MODELING THE EUTROPHICATION PROCESS.
Utah Water Research Lab., Logan.
Proceedings of a workshop, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State Univ. November 1973. 228 p, 118 fig, 34 tab, 313 ref.

Descriptors: *Mathematical studies, *Eutrophication, *Lakes, *Model studies, Algae, Phosphorus, Nutrients, Biota, Thermocline, Ecosystems, Biological communities, Cycling nutrients, Carbon, Oxygen, Nitrogen, Plankton, Phytoplankton, Water management(Applied), Diversion, Forecasting, Dynamics, Minnesota, Ohio, Wisconsin, Washington, Cyanophyta, Sediments, Cost-benefit analysis, Welfare(Economics), Water pollution control, Lake Erie.
Identifiers: *Lake restoration, Lake Sammamish(Wash.), Lake Washington(Wash.), Shagawa Lake(Minn.), Lake Wingra(Wis.), Twin Lakes Watershed(Ohio), Lake Mendota(Wis.), Lake George(N.Y.).

Papers presented at the workshop include the following subjects: (1) Long-term lake recovery related to available phosphorus, (2) Modeling algal growth dynamics in Shagawa Lake, Minnesota, with comments concerning projected restoration of the lake, (3) Simulation of urban runoff, nutrient loading, and biotic response of a shallow eutrophic lake, (4) Some aspects of phosphorus dynamics of the Twin Lakes Watershed, (5) The role of thermocline migration in regulating algal blooms, (6) Need for an ecosystem perspective in eutrophication modeling, (7) Multi-nutrient dynamic models of algal growth and species competition in eutrophic lakes, (8) Rates of carbon, oxygen, nitrogen, and phosphorus cycling through microbial populations in stratified lakes, (9) Capabilities and limitations of a nutrient-plankton model, (10) Phytoplankton population changes and nutrient fluctuations in a simple aquatic ecosystem model, (11) Aquatic modeling in the Eastern Deciduous Forest Biome, U.S.-International Biological Program, (12) A physical model for simulation of aquatic ecosystems, (13) Activity analysis and the management of resources: A model for control of eutrophication, (14) Component description and analysis of environmental systems: Oxygen utilization in aquatic microcosms, (15) Predicting the effects of nutrient diversion on lake recovery. A synopsis of the workshop and discussions are included. (See W74-06561 thru W74-06576) (Auen-Wisconsin)
W74-06560

SYNOPSIS OF WORKSHOP ON MODELING OF THE EUTROPHICATION PROCESS,
California Univ., Berkeley. Sanitary Engineering Research Lab.
P. H. McGauhey.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Utah, Water Research Laboratory, Utah State University, November 1973, p 1-4.

Descriptors: *Eutrophication, *Mathematical models, *Analytical techniques, Methodology, Design, Technology.
Identifiers: *Lake reclamation, State-of-the-art.

The workshop revealed that the present state-of-the-art is far too primitive to produce either the universal model or to evaluate correctly the inputs which should go into it. The inability to construct or to formulate a universal model leads to the next best approach: that is to make specific models which may be used to protect specific lakes; and then try to expand these models to universalize them. The question is raised as to why any individual model is not further used. Items stressed by several participants are that: vertical mixing is important; models should include the effects of sediments in supplying nutrients; relative recovery rate of a lake may be a key to where management should be given priority; it is conceptually feasible to link hydrologic and lake response in a simulation model, or to the relative physical system to the response of biota systems (not vice-versa); models which link land and water are needed; land use in many cases determines the nutrient input; temperature is a more important factor than realized; feedback of nutrients during growing season

is not included in models which complicates the problem of interpreting the relationship of early fast growing organisms followed by slower growing organisms. (See also W74-06560) (Auen-Wisconsin)
W74-06561

LONG-TERM LAKE RECOVERY RELATED TO AVAILABLE PHOSPHORUS,
Washington Univ., Seattle. Dept. of Civil Engineering.
E. B. Welch, C. A. Rock, and J. D. Krull.
In: Proceedings of a Workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 5-13. 7 fig, 15 ref. NSF O-B-36810X, EPA R-800512.

Descriptors: *Mathematical models, *Lakes, *Reclamation, *Phosphorus, Washington, Sediments, Water quality control, Phytoplankton, Biomass, Eutrophication, Iron, Hypolimnion, Anaerobic conditions.
Identifiers: *Lake recovery, Lake Washington(Wash.), Lake Sammamish(Wash.).

Lake Washington's recovery is compared with Lake Sammamish, leading to some new hypotheses about internal mechanisms affecting the diversion response-phosphorus income relationship. In five years after diversion of one-third of its phosphorus input, Lake Sammamish showed no significant response while Lake Washington responded promptly to phosphorus decrease. The probable explanation is that the phosphorus income change to Sammamish has occurred on the asymptote portion of a response curve that allows for much less lake response to a given increase in phosphorus income than observed in Lake Washington. The internal mechanism that probably controls the phosphorus content available is large concentrations of iron released from sediments into an anaerobic hypolimnion, which complexes and subsequently resediments phosphorus before it is available to phytoplankton. Strong control of water column concentrations of total phosphorus by large exchanges of phosphorus with sediments was supported by a gross model predicting phosphorus response to income change. If sediment release rate was held constant and sedimentation rate was allowed to vary with phosphorus concentration then only a slight reduction in concentration was predicted and which would have occurred rapidly. (See also W74-06560) (Jones-Wisconsin)
W74-06562

MODELING ALGAL GROWTH DYNAMICS IN SHAGAWA LAKE, MINNESOTA, WITH COMMENTS CONCERNING PROJECTED RESTORATION OF THE LAKE,
Pacific Northwest Environmental Research Lab., Corvallis, Oreg.
D. P. Larsen, H. T. Mercier, and K. W. Malueg.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 15-31. 10 fig, 2 tab, 20 ref.

Descriptors: *Mathematical models, *Eutrophication, *Plant growth, *Dynamics, Lakes, Minnesota, Reclamation, Phosphorus, Water quality control, Cycling nutrients, Nitrogen, Solar radiation, Sediments.
Identifiers: *Shagawa Lake(Minn.), Lake restoration.

The dominant source of phosphorus in Shagawa Lake has been from wastewater discharge. A model is presented which describes algal dynamics within the lake and suggests that current models simulating lake recovery may be inappropriate for the Shagawa Lake system. The hydraulic, phosphorus, and nitrogen budgets are given. The model simulates the observed spring algal bloom and demonstrates sensitivity to the magnitude of a hypothesized loss coefficient in both timing and magnitude of the algal bloom. It does not simulate the large late summer bloom of algae observed in the lake unless sediment nutrient supply and nitrogen fixation are included. It simulates the general cycle of available nitrogen and available phosphorus concentration, however. If the algal demand for available nitrogen can be met and if the rate of growth is regulated by the rate of supply of available phosphorus, the model will simulate the low levels of both available nitrogen and available phosphorus observed during the summer months. The role of the sediments in providing critical nutrients to overlying waters has been demonstrated and it is likely that the sediments will extend the recovery of the lake beyond the projected time span. (See also W74-06560) (Jones-Wisconsin)
W74-06563

SIMULATION OF URBAN RUNOFF, NUTRIENT LOADING, AND BIOTIC RESPONSE OF A SHALLOW EUTROPHIC LAKE,
Wisconsin Univ., Madison. Inst. for Environmental Studies
D. D. Huff, J. F. Koonce, W. R. Ivarson, P. R. Weiler, and E. H. DeHmann.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 33-35. 25 fig, 3 tab, 15 ref. NSF AG-199, 40-193-69.

Descriptors: *Model studies, *Urban runoff, *Nutrients, *Ecosystems, Biological properties, Shallow water, Eutrophication, Lakes, Watersheds(Basins), Runoff, Phosphorus, Nitrogen, Productivity, Biomass, Phytoplankton.
Identifiers: *Lake Wingra(Wis.).

Research and modeling results are synthesized to simulate the behavior of the linked terrestrial and aquatic components of the Lake Wingra, Wisconsin basin ecosystem. Runoff to the lake was simulated, groundwater flows estimated, records made of lake discharge and lake stage, lake evaporation, and nutrient sources simulated. This modeling effort entails the coupling of detailed mechanistic models of the hydrology of a lake's drainage basin, prediction of nutrient loading, and biotic response. Although the model is simplified for a shallow lake, system specific regressions were utilized in the simulations sparingly, and only where mechanistic models have yet to be developed. The model represents a significant synthesis of the understanding of ecosystem functioning. The use of models as hypotheses of ecosystem behavior, therefore yields a tool for studies of management alternatives for aquatic systems. As such a tool, a model helps fill the gap between scientific insight and emprical type analyses. Simulation models may nevertheless allow for more rigorous testing of empirical models or management recommendations. This modeling effort indicates the feasibility of using detailed simulation models of lakes and their drainage basins. (See also W74-06560) (Jones-Wisconsin)
W74-06564

SOME ASPECTS OF PHOSPHORUS DYNAMICS OF THE TWIN LAKES WATERSHED,
Kent State Univ., Ohio. Center for Urban Regionalism.
G. D. Cooke, T. N. Bhargava, M. R. McComas, M. C. Wilson, and R. T. Heath.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 57-72. 8 fig, 10 tab, 20 ref. EPA 16010-HCS (R-801936).

Descriptors: *Demonstration watersheds, *Phosphorus, *Model studies, *Cycling nutrients, *Eutrophication, Ohio, Nutrient removal, Septic tanks, Shallow water, Ecosystems, Depth.
Identifiers: *Twin Lakes(Ohio), Nutrient diversion, Lake restoration, Small watersheds.

The small experimental Twin Lakes Watershed in Ohio is currently undergoing nutrient diversion (septic tank drainage) and presents a sampling design which facilitates the compartmentalization of the terrestrial and aquatic portions of this ecosystem. The most important phosphorus source was surface inflows to the lakes. The study considered the effects of nutrient diversion on hydrologic, geochemical, and limnological features of the watershed and the lakes, and examined methods of phosphorus inactivation as a step to recliming the lakes. The theory of ecosystem development provides the holistic framework needed to understand the relationship between activities of the terrestrial portion of a watershed and the response of aquatic communities to changes in these activities. Water and phosphorus inflows and outflows of the two lakes were measured, along with many other geological and limnological aspects. The assumptions normally applied to predict the time of lake recovery seem unjustified for the Twin Lakes due to their shallow depth and small size. Because the calendar year for calculations may not represent an interval of limnological time, a new time interval is being explored--the limnological year--based on the duration of an ecological event which may greatly facilitate statistical and mathematical analyses. (See also W74-06560) (Jones-Wisconsin)
W74-06565

THE ROLE OF THERMOCLINE MIGRATION IN REGULATING ALGAL BLOOMS,
Wisconsin Univ., Madison. Water Chemistry Program; and Texas A and M Univ., College Station. Dept. of Civil Engineering.
R. E. Stauffer, and G. F. Lee.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 73-82. 6 fig, 1 tab, 15 ref. EPA 16010-EHR, TG5P2-WP-184-04.

Descriptors: *Thermocline, *Cycling nutrients, *Spatial distribution, *Eutrophication, Wisconsin, Phosphorus, Cyanophyta, Water quality, Nitrogen, Chlorophyll, Thermal stratification, Temperature, Epilimnion, Mathematical models, Nutrients.
Identifiers: *Lake Mendota(Wis.).

It is hypothesized that surges of algae biomass are dependent on refluxing of nutrients by periodic depression of the thermocline by meteorologic inputs. Field investigations of possible significance of this mechanism as a factor in controlling blue-green algal blooms in Lake Mendota, Wisconsin are reported. Meteorologic data were provided by the U.S. Weather Bureau. Sampling was accomplished by vertical profiling and chlorophyll sampling every meter down past the thermocline. The model predicts transport of nitrogen and phosphorus based on measurements of initial and final stages of density partitioned water column. This is an example of a lake definitely not in a steady nutrient transport state during stratified periods; instead, it depends on a stochastic process for recycling its own nutrient pool to maintain high chlorophyll levels. This type of periodic nutrient enrichment may be important in temperate lakes where metalimnetic reservies of nitrogen and phosphorus accumulate during stratified periods and where the mechanism for recycling of nutrients must be considered in estimating intra-lake nutrient transfers and in analysis of interactions among morphometric characteristics of lakes and time sequence of nutrient additions from external sources as they relate to biological productivity. (See also W74-06560) (Jones-Wisconsin)
W74-06566

NEED FOR AN ECOSYSTEM PERSPECTIVE IN EUTROPHICATION MODELING,
Georgia Univ., Athens. Dept. of Zoology; and Georgia Univ., Athens. Inst. of Ecology.
B. C. Patten.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 83-87. 1 fig, 9 ref.

Descriptors: *Mathematical studies, *Ecosystems, *Eutrophication, *Mathematical models, Control, Trophic level, Abatement, Dynamics, Watersheds(Basins).
Identifiers: *Lake restoration.

Modeling the eutrophication process seems mainly to be concerned with the primary production subsystem of lake ecosystems. The exogenous drives are basically nutrient loadings and photosynthetic energy inputs, and the internal processes include physiological parameters of algal nutrition, limnological parameters of water mass and entrained nutrient dynamics. The appropriate minimal conceptual unit for modeling eutrophication is the whole ecosystem as ecosystem components are all mutually dependent. Consequently, control points for attacking eutrophication exist everywhere in the ecosystem, not just in the nutrient and producer parameters. Theoretically, remote control may be more important in ecosystems than direct control. That is, parameters far removed from a state variable in the interconnection network may be more significant in controlling that state than other, more closely associated parameters. In applications, the reciprocal principle in combination with the knowledge that ecosystems are completely controllable can form the basis for broader avenues of attack on environmental problems. The distinct possibility exists that small (inexpensive), well chosen and correctly timed (both determined from sensitivity analysis or optimal control theory) manipulations of ecosystem parameters, remote from the nutrient-primary production subsystem, may be able to produce dramatic improvements in water quality for the amount of control effort expended. (See also W74-06560) (Jones-Wisconsin)
W74-06567

MULTI-NUTRIENT DYNAMIC MODELS OF ALGAL GROWTH AND SPECIES COMPETITION IN EUTROPHIC LAKES,
Notre Dame Univ., Ind. Dept. of Civil Engineering; Notre Dame Univ., Ind. Dept. of Chemical Engineering; Illinois Univ., Chicago. Dept. of Biological Sciences; and TenEch Environmental Consultants, South Bend, Ind.
V. J. Bierman, Jr., F. H. Verhoff, T. L. Poulson, and M. W. Tenney.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 89-109. 10 fig, 88 ref. EPA R-801245.

Descriptors: *Plant growth, *Nutrients, *Mathematical models, *Limiting factors, Eutrophication, Absorption, Competition, Biological communities, Phosphorus, Nitrogen, Cycling nutrients, Nuisance algae.
Identifiers: *Lake restoration, *Algal growth, Cell synthesis.

Kinetic equations describing algal growth in eutrophic lakes' surface waters are considered. A two-step growth model, involving separate nutrient transport and cell synthesis mechanisms, was developed and applied to one- and two-species systems where phosphorus was the primary nutrient regulating growth and to a two-specie system where phosphorus and nitrogen were important regulators. Temperature effects, cell sinking, cell decomposition, nutrient recycle, and predation were included. For the case of phosphorus-dependent growth of a single algal species, the proposed model predicts a lag between phosphorus removal from solution and subsequent algal growth. Because of luxury phosphorus uptake, 85% of the algal crop developed after 50% of the phosphorus had been removed. It is concluded that detailed knowledge of the complex metabolic processes that occur inside microorganisms is not necessary in order to develop a realistic, analytical model of algal growth. Results of the two-species system in which phosphorus is the regulating nutrient, show that species differences in phosphorus uptake efficiencies and in minimum phosphorus requirements are sufficient causes to explain the frequently observed correlation between nuisance blooms of blue-green algae and low nutrient concentrations. A higher degree of internal stability can be obtained in a two-species system as opposes to a single-species system. (See also W74-06560) (Jones-Wisconsin)
W74-06568

RATES OF CARBON, OXYGEN, NITROGEN, AND PHOSPHORUS CYCLING THROUGH MICROBIAL POPULATIONS IN STRATIFIED LAKES,
Notre Dame Univ., Ind. Dept. of Chemical Engineering; and Notre Dame Univ., Ind. Dept. of Civil Engineering.
C. F. Cordeiro, W. F. Echelberger, Jr., and F. H. Verhoff.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 111-120. 4 fig, 4 tab, 22 ref.

Descriptors: *Eutrophication, *Mathematical models, *Cycling nutrients, Carbon, Oxygen, Nitrogen, Phosphorus, Microorganisms, Population, Lakes, Stratification, Nutrients, Kinetics, Chemical properties, Dynamics, Bacteria, Bicarbonates, Phosphates, Ammonia, Nitrates.
Identifiers: *Lake restoration, Microbial cell growth, Stoichiometry.

Cycling rates of carbon, oxygen, nitrogen, and phosphorus through the various components of a lake system were investigated with a mathematical model to determine the major nutrient sources and the system components which use most of each element as a guide to which species may be most affected by changes in the system and enable a qualitative prediction of the results of corrective actions. The kinetics of cell growth were developed from a mechanism which postulates that this growth is accomplished by the transport of metabolites from the exterior of the cell to the interior, and the chemical conversion of these chemicals into cellular photoplasm. The elemental composition of the microbial population was determined from an average composition and used as a basis for deriving the various stoichiometric relationships used in the model. The lake was simulated as consisting of two layers, each with its set of biological and chemical components. The symbiotic activity of the algae and bacteria as regards to oxygen and bicarbonate production and utilization is clearly evident in the model. It is also possible to study the sources and sinks of the other elements. The settling and silting rate can also be determined from the model. (See also W74-06560) (Auen-Wisconsin)
W74-06569

CAPABILITIES AND LIMITATIONS OF NUTRIENT-PLANKTON MODEL,
Washington State Univ., Pullman. Dept. of Zoology and Washington State Univ., Pullman. Dept. of Computer Science.
R. A. Parker.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 121-130. 6 fig, 3 tab, 14 ref.

Descriptors: *Nutrients, *Plankton, *Mathematical models, *Eutrophication, Ammonia, Plant growth, Mortality, Copepods, Crustaceans, Temperature, Photosynthesis, Phosphates, Nitrogen, Nitrates, Phytoplantkon, Chlorophyll, Seasonal, Light intensity.
Identifiers: *Kootenay Lake(British Columbia), Lake restoration.

A detailed evaluation of the course of eutrophication suggests a strategy of model formulation which focuses on nutrient-plankton relationships. Since ammonium may be used preferentially as a nitrogen source by certain phytoplankters, this study evaluates the performance of a coupled system of nutrient and plankton differential equations which incorporated this assumption in contrast to one without preference. The growth and mortality functions adopted for the algal groups, and for the two zooplankton groups (cladocerans and copepods) are tabulated. Horizontal transport is recognized for each variable, and vertical diffusivity has been included for the nutrients. Only the upper 'mixed' layer was modeled, limited to 10 m so that virtually all photosynthetic activity was included. Photosynthetic rate, nutrient uptake, and cell nutrient content may or may not all exhibit Monod dependence on external nutrient concentration. Simulation results for phytoplankton, phosphate, nitrate, ammonium, copepods, and cladocerans are presented for a three-year period. It seems apparent that the model does not depend heavily on modifications in the Monod nitrate-ammonium growth functions, nor on the half-saturation constant for phosphate. The performance of this model is under the over-riding influence of a structure inherently dependent on temperature and light intensity. (See also W74-06560) (Jones-Wisconsin)
W74-06570

PHYTOPLANKTON POPULATION CHANGES AND NUTRIENT FLUCTUATIONS IN A SIMPLE AQUATIC ECOSYSTEM MODEL,
Federal Water Quality Administration, Athens, Ga. National Pollutants Fate Research Program.
R. R. Lassiter, and D. K. Kearns.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 131-138. 4 fig, 11 ref.

Descriptors: *Mathematical models, *Phytoplankton, *Biota, *Nutrients, *Physicochemical properties, Ecosystems, Light, Temperature, Eutrophication, Phosphorus, Succession, Biomass, Seasonal, Dynamics, Hydrogen ion concentration.

This oversimplified model consists of equations describing a physicochemical system and associated biota. Physical aspects of the system consist of light, temperature, and an atmosphere containing 0.033% carbon dioxide. Chemical aspects consist of a set of dissolved inorganic and organic chemicals. It is assumed that the organic chemicals do not participate directly in the chemical equilibria. The biotic system consists of six phytoplankton species and heterotrophic microorganisms. The model contains explicit equations for the phytoplankton, but the heterotrophic microorganisms are included only implicity. Algal growth rates are temperature dependent. Among results obtained thus far are those which point to timing of significant ecological events (such as phosphorus reaching critically low concentrations) as important in phytoplankton competition. In some cases pH may prove to be a good indication of the time of occurrence of such events. It is also postulated that fast growing phytoplankton may dominate the early growing season, while slower growing forms capable of using lower nutrient concentrations may dominate a later season growth when their ability to utilize nutrients equals or exceeds the rate of bacterial remineralization. (See also W74-06560) (Jones-Wisconsin)
W74-06571

AQUATIC MODELING IN THE EASTERN DECIDUOUS FOREST BIOME, U.S.-INTERNATIONAL BIOLOGICAL PROGRAM,
Rennsselaer Polytechnic Inst., Troy, N. Y.
J. A. Bloomfield, R. A. Park, D. Scavia, and C. S. Zahoreak.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 139-158. 7 fig, 8 tab, 32 ref. AG-199,40-193-69.

Descriptors: *Ecosystems, *Computer programs, *Eutrophication, Methodology, Hydrology, Biota, Nutrients, Biomes, Mathematical models, New York, Wisconsin.
Identifiers: *Eastern Deciduous Forest Biome, Lake George(N.Y.), Lake Wingra(Wis), Biome model CLEAN, WNGRA2 model, PL/1 FORTRAN, DYNAMO, UNIVAC 1108, IBM 370/165, Model Components, SIMPLE model.

To predict the consequences of perturbations of aquatic ecosystems, Lake George, New York and Lake Wingra, Wisconsin were the bases of mechanistic aquatic models capable of forecasting nutrient enrichment effects, thermal pollution, siltation and other by-products of man's activities; in addition the models present a degree of ecologic insights gained through the large-scale integrated studies of the International Biological Program. Q-mode cluster analysis and ordination of data helped to confirm that Lake George sampling stations were representative of differing degrees of eutrophication. R-mode cluster analysis and data ordination from both Lake George and Lake Wingra are helping in the definition of functional groups. CLEAN is programmed in modular form so that one can execute a specific submodel, such as for net phytoplankton, or link any meaningful combination of submodels as required. WNGRA2 is a site-specific model of mixed levels of resolution. SIMPLE is an eighth-order nonlinear compartmental model structured primarily to examine effects of excessive phosphate loadings and was designed specifically to simulate Lake George conditions but, with only slight modifications can be applied to any lake. The state variables represent larger ecologic groupings than in CLEAN, the time step is weekly, and the model considers only the most significant transfers. (See also W74-06560) (Auen-Wisconsin)
W74-06572

A PHYSICAL MODEL FOR SIMULATION OF AQUATIC ECOSYSTEMS,
Federal Water Quality Administration, Athens, Ga. National Pollutants Fate Research Program.
J. W. Falco, and W. M. Sanders, III.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 159-169. 13 fig, 3 tab, 6 ref.

Descriptors: *Eutrophication, *Model studies, *Prototypes, Turbulence, Streamflow, Dispersion, Reaeration, Channels, Light quality.
Identifiers: *Aquatic Process Simulator.

The Aquatic Ecosystem Simulator was designed as a process physical model, as opposed to a geometric or hydrodynamic model, which would simulate biological and chemical responses of natural flowing streams to a wide range of environmental perturbations. In addition to providing information on microbial growth kinetics, the simulator will provide the capability for introducing significant material gradients along the length of a water channel and thus provide a facility to study the role of transport phenomena in environmental water quality problems. A third feature is the variable light source which simulates solar radiation, not only in terms of total intensity but also in terms of spectral distribution for the study of photosynthetic processes. The reason for the delays between the development of partially controlled streams and studies with microcosms and development of scaled physical models is largely one of cost; this facility cost approximately $1 million. In addition to the physical calibrations, microbial growth experiments with bacterial and mixed bacterial and algal populations will be performed to measure growth rates of these organisms as function of turbulent mixing rates, water temperature, nutrient concentration, and other pertinent environmental parameters. (See also W74-06560) (Jones-Wisconsin)
W74-06573

ACTIVITY ANALYSIS AND THE MANAGEMENT OF RESOURCES: A MODEL FOR CONTROL OF EUTROPHICATION,
Utah Water Research Lab., Logan.
D. B. Porcella, A. B. Bishop, and W. J. Grenney.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 171-186. 10 fig, 3 tab, 14 ref. EPA 68-01-0728.

Descriptors: *Cost-benefit analysis, *Model studies, *Management, *Eutrophication, *Phosphorus, Welfare(Economics), Costs, Control, Decision making, Lake Erie, Analysis, Water quality control.
Identifiers: *Phosphorus management, Phosphorus loading, Cost-effectiveness, Case study.

This study aimed at achieving a relatively complete understanding of phosphorus inputs as a management tool for phosphorus control. The system in which phosphorus is utilized is described, possible alternatives for controlling phosphorus input to surface waters determined and the least-cost strategy for controlling that phosphorus input ascertained. The model can be applied to any region or river basin using easily obtainable data. With Lake Erie as an example, changes in phosphorus input due to various management tactics resulted in changes in relative eutrophication. Treatment costs associated with management strategies were related to effectiveness, and use of cost-effectiveness analysis for selecting the most comprehensive set of management factors is deomonstrated. Conclusions are that use of activity analysis to control the effects of a particular resource, in this case, phosphorus, is a reasonable approach. Management of a resource rather than treatment alone should be instituted when real costs of management controls are less than treatment costs saved or avoided. In Lake Erie use of management controls can result in significant treatment cost savings. A combination of management controls and treatment processes can result in lowering eutrophication levels to about the mesotrophic range, at least, with respect to phosphorus loadings. (See also W74-06560) (Jones-Wisconsin)
W74-06574

COMPONENT DESCRIPTION AND ANALYSIS OF ENVIRONMENTAL SYSTEMS: OXYGEN UTILIZATION IN AQUATIC MICROCOSMS,
Georgia Univ., Athens; and Utah Water Research Lab., Logan.
J. Hill, IV, and D. B. Porcella.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 187-203. 8 fig, 5 tab, 27 ref.

Descriptors: *Design, *Model studies, *Analysis, *Methodology, *Energy transfer, Simulation analysis, Hydrologic systems, Systems analysis, Eutrophication, Mud-water interfaces, Mathematical models, Computers, Equations.
Identifiers: *Component analysis, *Component description, System transfer function, System properties.

The technique of component description and systems analysis is applied to an environment system, specifically to aquatic microcosms serving as analogues for the mud-water environment of eutrophic lakes. Component description of environmental systems is a detailed method of arriving at a system model which includes a great deal of information concerning processes of energy transfer and transformation. If component values are not available or accessible for measurement, the component analysis is tedious and expensive. However, the component values resulting from a component analysis are applicable to the same component in a similar system; therefore, some component analyses need only be done once. Modeling of environmental systems for impact studies, development planning, or similar purposes with specific applications to a specific area is probably best done using compartmental techniques. Modeling environmental systems to understand processes, general application of controls, and man-made perturbations is probably best done using component techniques. The analysis demonstrated illustrates the analytical process and attempts to point out some of the pitfalls as well as advantages in the application of the technique. (See also W74-06560) (Jones-Wisconsin)
W74-06575

PREDICTING THE EFFECTS OF NUTRIENT DIVERSION ON LAKE RECOVERY,
Battelle Pacific Northwest Lab., Richland, Wash.
M. W. Lorenzen.
In: Proceedings of a workshop on Modeling the Eutrophication Process, September 5-7, 1973, Logan, Utah, Water Research Laboratory, Utah State University, November 1973, p 205-210. 1 tab, 2 fig, 5 ref.

Descriptors: *Mathematical models, *Forecasting, *Nutrients, *Diversion, Lakes, Reclamation, Eutrophication, Sediments, Methodology.
Identifiers: Lake restoration, Nutrient diversion, Nutrient concentrations.

Model derivations are summarized showing how different assumptions about nutrient exchange processes can result in varying predictions concerning lake recovery. Model I is that in which net loss of nutrient to the sediment is considered proportional to the average concentration of that nutrient in the water. Model II considers both loss to sediments and return from sediments as independent processes and assumes that nutrient concentration in the sediment does not change appreciably over time. Model III considers coupled equations describing transfer into and out of sediments. All three models are idealized and simplified representations of complex precesses. Models II and III not only represent improvement over existing models but show important variables. Because data available for comparing these models are limited, hypothetical conditions were used for example calculations summarizing various parameters for four lakes. These values were used to calculate nutrient concentrations as a function of time illustrating that each model can predict very different results. Any model should first be checked to insure that it predicts accurately prediversion lake conditions before it is used to evaluate the effects of nutrient diversion. The seemingly disparate results are due to initial conditions which are not at steady state with loading rates. (See also W74-06560) (Jones-Wisconsin)
W74-06576

THE IMPACT OF SLIMES-DAM FORMATION ON WATER QUALITY AND POLLUTION,
Department of Water Affairs, Pretoria (South Africa).
For primary bibliographic entry see Field 5B.
W74-06604

AN ECOLOGICAL ACCOUNT OF THE PAST AND FUTURE OF SOUTH AFRICAN RIVERS,
National Inst. for Water Research, Congella (South Africa). Regional Lab.
F. M. Chutter.
Limnological Society of South Africa Newsletter No. 21, p 22-34, November 1973. 48 ref.

Descriptors: *Ecology, Rivers, *Water quality, *Biota, Aquatic life, Water storage, Soil erosion, Land management, Reservoir operation, Water pollution control, Water pollution effects.
Identifiers: *South Africa.

Changes brought about in South African rivers by human activities in the past, and their known effects on the biota are described. Probable future changes in rivers are described in relation to population growth, agricultural practice and water consumption. Rivers will be increasingly affected by impoundments and diffuse sources of chemical contaminants. While the biological consequences of many types of change may be predicted, little is known about the effects of impoundments and their management on rivers downstream of impoundments in South Africa. (DWA)
W74-06606

UTILIZATION OF PHOSPHORUS BY PHYTOPLANKTON IN PHOSPHORUS-RICH ENVIRONMENTS,
Georgia Inst. of Tech., Atlanta. School of Biology.
J. R. Strange.
Available from the National Technical Information Service as PB-231 304, $3.25 in paper copy, $1.45 in microfiche. Georgia Environmental Resources Center, Atlanta, ERC-1373, January 1974, 34 p, 23 fig, 2 tab, 11 ref, 3 append. OWRR A-035-GA(1). 14-31-0001-3810.

Descriptors: *Phosphorus, *Phytoplankton, *Eutrophication, *Algae, Waste assimilative capacity, Absorption, *Georgia.
Identifiers: *Lake Sidney Lanier(Geo), Phosphorus uptake, Chlorococcum, Fragillaria, Nostoc.

A study was made of the eutrophic Flat Creek embayment of Lake Sidney Lanier near Gainesville, Georgia, to determine to what degree phosphorus in luxury concentration could be utilized by various species of phytoplankton. Three prominant species of algae, Chlorococcum, Fragillaria and Nostoc, were grown under experimental conditions to determine their response to luxury amounts of phosphorus. Unialgal cultures were established in modified Winegradsky columns with a modified Chu's No. 10 medium. Phosphate levels of 0.15 ppm resulted in rapid growth, and the cultures reached maximum biomass levels after two or more weeks. Luxury amounts of P32 were added to a 100 ml sample from the enriched culture, increasing by more than 34-fold the concentration of phosphorus. Uptake of P32 varied from less than 20% for Nostoc to greater than 80% of the P32 added for Chlorococcum. However, if Nostoc was previously deprived of phosphorus, its subsequent uptake ability increased markedly. For the species studied, P32 uptake was directly proportional to the surface-per-volume ratio, similar to results found in marine benthic algae. These results show that phytoplanton can uptake large amounts of phosphorus entering a lake through municipal or industrial waste discharges, but further research is needed to ascertain whether removal of phosphorus by this means retards eutrophication or whether the phosphorus continues up the food chain.
W74-06611

UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES,
Bendix Corp., Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W74-06698

ERTS-1 OBSERVES ALGAL BLOOM IN LAKE ERIE AND UTAH LAKE,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-06699

STUDIES ON THE PHOTOSYNTHETIC PIGMENTS AND THEIR DECOMPOSITION IN THE SEDIMENT OF LAKE BALATON AND LAKE BELSO,
Magyar Tudomanyos Adademia, Tihany. Biological Research Inst.
J. Olah.
Ann Inst Biol (Tihany) Hung Acad Sci. 39. p 115-121, 1972. Illus.
Identifiers: Benthos, *Chlorophyll, Decomposition, *Hungary(Lake Balaton), Lakes, *Photosynthetic pigments, Primary production, *Hungary(Lake Belso), *Lake sediments, Anaerobic conditions.

In the examination period, the chlorophyll-a content of the mud surface in Lake Balaton (Hungary) was 29-71 mg/m2. The Moss and Tietjen ratios as well as the absorption spectra and the pheo-pigment content computed by using the equation of Lorenzen showed that a large proportion of the pigment was in an active condition. These results suggest that the contribution of the microphytobenthos to the primary production of the lake is considerable. The chlorophyll-a content of the superficial layer of the mud in the highly eutrophic Lake Belso was 66 mg/m2, with a highest proportion of pheo-pigments. In the upper 12 cm layer of mud the pigments were of homogeneous distribution. The pheo-pigments are suggested to originate from the rich phytoplankton, and their destruction is retarded by the semi-anaerobic condition of the water sediment interface.--Copyright 1973, Biological Abstracts, Inc.
W74-06741

ORGANIC PHOSPHORUS COMPOUNDS OF A NORTHERN MICHIGAN BOG, BOG-LAKE SYSTEM,
Michigan Univ., Ann Arbor. School of Natural Resources.
J. P. Koenings, and F. F. Hooper.
In: Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A). December 1972, p 3-22. 6 fig, 2 tab, 32 ref. ORA 016440, AEC AT(11-1)-1771.

Descriptors: *Phosphorus compounds, *Dystrophy, *Bogs, *Lakes, Trophic level, Tracers, Cycling nutrients, Analytical techniques, Organic acids, *Michigan.
Identifiers: *North Gate Lake(Mich.), Polyphosphates.

Certain Michigan bog lakes do not follow the high productivity pattern concomitant with high phosphorus content common in enriched eutrophic lakes. This study describes the chemical nature and distribution of the organic phosphorus compounds in North Gate Bog, bog-lake system and presents data from a P-32 labeling experiment which bears upon the dynamics and cycling of these compounds and upon the paradoxical relationship between nutrient level and productivity. Optical density in the ultraviolet at 260 nm in conjunction with ion exchange chromatography separation of the inorganic and organic acids containing phosphorus was used for determination of the hydrolysis products of the ribonucleic acids as well as the related free mono-, di-, and triphosphorylated nucleotides as part of dissolved organic phosphorus. Compounds produced in the bog mat appear to be hydrolysis products of ribonucleic acids as well as free mono-, di-, and triphosphate nucleotides. While inorganic phosphorus of the epilimnion and the mat waters appears to be chiefly orthophosphate, the hypolimnion contains an inorganic pool consisting of both ortho- and polyphosphate phosphorus. Lack of polyphosphates in the hypolimnion indicates that these compounds arise from in situ autolysis of algae or bacteria rather than from materials produced in the euphotic zone. (See also W73-14185) (Auen-Wisconsin)
W74-06742

PRELIMINARY REPORT OF THE ROLE OF SPHAGNUM IN THE CYCLING OF PHOSPHORUS IN A BOG-LAKE SYSTEM,
Michigan Univ., Ann Arbor. School of Natural Resources.
F. F. Hooper.
In: Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A). December 1972, p 23-48. 8 fig, 2 tab, 7 ref. ORA 016440, AEC AT(11-1)-1771.

Descriptors: *Cycling nutrients, *Phosphorus, *Mosses, Bogs, Lakes, Tracers, Phosphorus compounds, Organic compounds, Weather, Dystrophy, *Michigan.
Identifiers: *Bog mats, North Gate Lake(Mich.)

The North Gate Bog (Michigan) mat was investigated to determine the phosphorus return flow from the bog mat to the lake, the rates of exchange between the water and mat, and to define the chemical characteristics of the phosphorus compounds involved. The stable phosphorus of the mat interstitial water was measured and a section of the bog mat labeled. The marginal circulation scheme offers a pathway whereby both autochthonous seston and allochthonous debris can penetrate through the strong thermal barrier present in the lake during spring and summer. First, P-32 was applied directly to the Sphagnum surface producing a leachate consisting entirely of soluble unreactive phosphorus which was flushed into the lake when rains created a hydrological gradient of flow within the mat; this leachate not only penetrated the surface water but also entered the hypolimnion. A second label, which was injected directly into the interstitial water of the mat, produced a leachate which was an entirely particulate unreactive phosphorus; this was also flushed into the lake and persisted in the surface water with little or no loss or transformation in excess of three weeks. Both of the label fractions penetrated to the lower parts of the hypolimnion. (See also W73-14185) (Auen-Wisconsin)
W74-06743

IONIC STATE AND COORDINATION OF IRON IN BOG LAKES,
Michigan Univ., Ann Arbor. School of Natural Resources.
J. P. Koenings.
In: Nutrient Cycling and Productivity of Dystrophic Lake-Bog Systems (Part A). December 1972, p 51-71. 5 fig, 6 tab, 27 ref. ORA 061440, AEC AT(11-1)-1771.

Descriptors: *Iron compounds, *Bogs, *Lakes, *Solubility, Distribution, Oxidation reduction potential, Hydrogen ion concentrations, Analytical techniques, *Michigan.
Identifiers: Ionic ferrous iron, Ferric iron, North Gate Lake(Mich.).

Separation and characterization of iron compounds present in the epilimnion and in the hypolimnion of acid bog North Gate Lake and also an assessment of the effects of reduced organic compounds on the forms of iron are described. In a dilute, low pH solution, as in a bog, Fe(II) becomes or remains ionic because of the weak ability of Fe(II) to form complexes. The anaerobic hypolimnion and the low dissolved oxygen concentration in the epilimnion, combine with a high amount of reducing substances, both organic and inorganic, and the low pH to provide an environment in which Fe(II) is preferred. The presence of ionic Fe(II) without complexation as the predominant form of iron in the deoxygenated waters of

the bog is confirmed. Results can be explained in terms of loose iron III-colored organic associations that allow iron to react as ionic ferric iron, probably due to a loose charge-to-charge interaction between un-ionized or weakly ionized organic acids, and Fe(III) produced by the oxidation of Fe(II) diffusing upward from the hypolmnion. pH controls the relative roles of iron and organic matter in oxygenated water. (See also W73-14185) (Auen-Wisconsin)
W74-06744

EFFECTS OF OIL DISPERSANTS AND OIL EMULSIONS ON MARINE ANIMALS,
Kristinebergs Zoologiska Station, Fiskebackskil (Sweden).
M. Swedmark, A. Granmo, and S. Kollberg.
Water Research, Vol 7, No 11, p 1649-1672, November 1973. 12 fig, 8 tab, 40 ref.

Descriptors: *Oil pollution, *Toxicity, *Bioassay, Fish, Mussels, Crabs, Water temperature, Salinity, Lethal limit, Sea water, Water pollution effects, Marine animals, Fjords, Respiration, Animal physiology, Fish behavior, Movement, Surfactants.
Identifiers: *Oil dispersants, *Oil emulsions, *Crude oil, Cod(Fish), Flounders, Bivalves, Cockles, Scallops, Prawns, Continuous flow technique, Macroinvertebrates, Fuel oil, Diesel oil.

The toxicities to marine animals of nine oil dispersants, three oil emulsions with Corexit and of a dispersion of Oman crude oil, were studied in continuous flow aquarium systems at 96 hr exposures followed by a recovery period in clean seawater. New types of dispersants were found to be less toxic than older types and oil emulsions more toxic than dispersants alone or crude oil alone. Fishes and bivalves were found most sensitive. Crustaceans were the most resistant to dispersants but very susceptible to oil emulsions. The tolerance of different species was found to be related to their mode of life, more active species being more susceptible. Delayed mortality of bivalves increased their susceptibility if the recovery period was included. Effects on locomotory behavior of fishes and crustaceans, breathing rate of fish, valve-closure of bivalves and byssal thread formation of common mussels have been demonstrated for both dispersants and oil emulsions. The general sequence of such effects was: increased activity; successively impaired activity; immobilization; and death. Recovery is good for fish and crustaceans but poor for bivalves due to the delayed effects. Ecological consequences of dispersants and oil pollution in the marine environment are discussed. (Mortland-Battelle)
W74-06745

SURVIVAL IN MATURATION PONDS OF COLIFORM BACTERIA WITH TRANSFERABLE DRUG RESISTANCE,
National Inst. for Water Research, Pretoria (South Africa).
W. O. K. Grabow, and I. G. Middendorff.
Water Research, Vol 7, No 11, p 1589-1597, November 1973. 6 tab, 41 ref.

Descriptors: *Water pollution effects, Resistance, Sewage treatment, *E. coli, *Sewage lagoons, Separation techniques, Pathogenic bacteria, Population, Antibiotics(Pesticides), Bactericides.
Identifiers: *Drugs, *Survival, *Salmonella typhi, Ampicillin, Chloramphenicol, Kanamycin, Streptomycin, Tetracycline, Bacterial physiology, South Africia.

The use of antimicrobial drugs which produces bacterial resistance that is mediated by R factors and is transferrable to other species raises questions regarding the survival of these bacteria in maturation ponds. Consequently studies were undertaken to investigate the behavior of drug-resistant coliform bacteria in a series of sewage maturation ponds in South Africa. Samples were collected from three ponds, the coliforms isolated, and E. coli I identified. The nalidixic acid-resistant strains E. coli E25 and Salmonella typhi N were used as recipients. Groups of 20 resistant coliforms selected at random from every sample were tested for transferable resistance. The average reduction through the ponds of coliforms resistant to ampicillin, Chloramphenicol, kanamycin, streptomycin or tetracycline was 6.83 percent lower than that of drug-sensitive bacteria. This difference was mainly due to coliforms with transferable resistance (R(plus) coliforms) which increased from 0.86 percent to 2.45 percent through the ponds. The spectrum of transferable resistance of coliforms in the effluent did not differ notably from that of coliforms in the influent. The averageincidence of Escherichia coli I among R(plus) coliforms decreased from 66.08 percent to 62.09 percent. This indicates that low-level transfer of R factors may occur in ponds. Possible mechanisms and the epidemiological significance of the increased survival of R(plus) coliforms in maturation ponds are discussed. (Little-Battelle)
W74-06748

CULTURE STUDIES OF ENTEROMORPHA LINZA (L.) J.AG. AND ULVARIA OXYSPERMA (KUTZING) BLIDING (CHLOROPHYCEAE, ULVALES) FROM CENTRAL AMERICA,
North Carolina Univ., Wilmington. Dept. of Biology.
D. F. Kapraun, and E. H. Flynn.
Phycologia, Vol 12, Nos 3/4, p 145-152, December 1973. 26 fig, 32 ref.

Descriptors: *Cultures, *Chlorophyta, *Marine algae, *Cytological studies, Plant morphology, Marine plants, Chromosomes, Benthic flora.
Identifiers: Central America, *Enteromorpha linza, *Ulvaria oxysperma, Culture media, Sample preservation, Sample preparation, *Columbia, *Costa Rica.

Enteromorpha linza and Ulvaria oxysperma from Columbia and Costa Rica, respectively, were studied by observations of material collected from nature and laboratory culture experiments. Cultures were maintained in enriched seawater media in an open-room incubator illuminated with 1500 lux incident light at 23C with 12-hr light and a 12-hr dark cycle. The algae were stained for chromosomes using a modified technique described by Kapraun (1970). Plant material was fixed in an 12KI-formalin solution during the middle of the dark cycle, washed in distilled water after 12 hr, and placed in an iron-alum mordant. Fronds were soaked in the mordant 2-5 min, rinsed thoroughly in distilled water and stained in acetocarmine for observation. Results of these investigations were compared with the literature from Japanese and European studies. Both E. linza and U. oxysperma were shown to be haplobiontic, reproducing exclusively by bi- and quadriflagellate zoospores. Results of cytological investigations are discussed: N equals 10 was indicated for E. linza, while no determination was possible for Ulvaria. (Holoman-Battelle)
W74-06749

TEMPERATURE CONTROL OF REPRODUCTION AND PRODUCTIVITY IN A SUBARCTIC CORALLINE ALGA,
National Museum of Natural History, Washington, D. C.
W. H. Adey.
Phycologia, Vol 12, Nos 3/4, p 111-118, December 1973. 12 fig, 8 ref.

Descriptors: *Water temperature, *Primary productivity, Reproduction, *Bioassay, *Light intensity, *Limiting factors, Growth rates, Ice cover, Marine algae, Atlantic Ocean, Oxygen, Seasonal, Rhodophyta, *Pacific Ocean, Physiological ecology.
Identifiers: *Clathromorphum circumscriptum.

Based on detailed quantitative distributional data for the North Atlantic and qualitative data for the North Pacific, a hypothesis of winter temperature control of reproduction and distribution is formulated for the crustose coralline alga Clathromorphum circumscriptum. The hypothesis, that winter temperatures below 2-3C are required for reproduction, was tested by growing plants for extended periods under various light and temperature conditions. Regimes from constant light cycle (12-12) and intensity (1200 lux) at a temperature of 12-13C, to reduction of both light and temperature over a 5 month interval to 6-18 hr light-dark periods, 130 lux and 0C, were employed in a manner approximately simulating the natural pattern in the shallow sublittoral of the Maine coast. Although conceptacle production was initiated in those tanks where the light cycle was reduced from 12 to 6 hr per day, mature conceptacles with bispores developed only in the tanks where the temperature was reduced. The most prolific plants were those subject to reduction of light cycle and intensity. In tanks having neither temperature nor light cycle reduction, only a very small percentage of primordial conceptacles were initiated and none of these developed to maturity. The productivity of Clathromorphum circumscriptum, based on oxygen exchange measured with a precision polarographic electrode, was examined at light intensities ranging from 0-4000 lux and temperatures ranging from 0-20C. The compensation point was reduced markedly with temperature, reaching levels of only 35 lux near 0C. This indicates a high level of efficiency in net productivity at very low temperatures, and suggests that under arctic conditions holoautotrophic plants probably can survive even where ice cover and winter darkness significantly reduce total light received. (Little-Battelle)
W74-06751

INFLUENCE OF IODINE ON GROWTH AND DEVELOPMENT OF THE BROWN ALGA ECTOCARPUS SILICULOSUS IN AXENIC CULTURES,
Scripps Institution of Oceanography, La Jolla, Calif.
M. L. Woolery, and R. A. Lewin.
Phycologia, Vol 12, Nos 3/4, p 131-138, December 1973. 4 fig, 13 ref.

Descriptors: *Marine algae, *Plant growth, *Iodine, *Essential nutrients, Deficient elements, *Phaeophyta, Bioassay, Plant physiology, Kelps, Marine plants, Cultures, Nutrient requirements, Laboratory tests, Germination, Plant pigments, Chlorophyll, Colorimetry.
Identifiers: *Ectocarpus siliculosus, Axenic cultures, Survival, Culture media, Carotenoids.

A quantitative evaluation was made of the iodine requirement of the brown alga Ectocarpus siliculosus using solely the female clone. Cultures were grown in (1) artificial seawater medium, of the same composition and prepared by the same method as was the starvation medium; (2) artificial seawater medium prepared similarly, but with sodium chloride which had not been pre-treated to remove iodine and bromine; (3) natural seawater; and (4) seawater similarly depleted of iodine and bromine. In a preliminary experiment prepared in quadruplicate, iodine and bromine were added, independently and together, and after 2, 4, 6, and 8 wk. growth in the first set of tubes was assayed colorimetrically for mixed chlorophylls and carotenoids. Another experiment was carried out to determine the effects of iodine concentrations lower than that in seawater. After 2, 3, and 4 wk. the algae were examined microscopically for the abundance of reproductive organs and zoospores and assayed colorimetrically. Nutrient-supplemented cultures were then incubated for an additional 6 wk, and reassayed for restoration of pigmentation. Filaments of E. siliculosus survived for at least 12 wk in iodine-deficient media; however iodine is an essential nutrient for growth. Iodine is not replaceable by bromine at any of the concen-

trations tested. At least 0.0015 microgram at iodine/l is required for any appreciable vegetative growth, while 0.025 microgram at/l is needed for the normal formation and maturation of plurilocular sporangia. (Natural seawater contains about 0.4 microgram at iodine/l). In 12-wk cultures, 0.2 microgram at iodine/l promotes maximum growth, equivalent to 4 g dry weight per litre of medium. Concentrations up to one hundred times as high are tolerated without evident inhibitory effects. (Holoman-Battelle)
W74-06752

YAMADAPHYCUS, A NEW GENUS OF THE DELESSERIACEAE (RHODOPHYTA),
Hokkaido Univ., Sapporo (Japan).
For primary bibliographic entry see Field 5A.
W74-06753

CYANOPHAGES - VIRUSES ATTACKING BLUE-GREEN ALGAE,
Hadassah Medical School, Jerusalem (Israel).
E. Padan, and M. Shilo.
Bacteriological Reviews, Vol 37, No 3, p 343-370, September 1973. 12 fig, 6 tab, 164 ref.

Descriptors: *Cyanophyta, *Viruses, *Reviews, *Bibliographies, Physicochemical properties, Proteins, Growth stages, Metabolism, Photosynthesis, Genetics, Cytological studies, Distribution patterns, Hosts, Plant morphology, Ecology, Plant viruses.
Identifiers: *Cyanophages, Nucleic acids, Phages, DNA, Adenosine triphosphate.

Characteristics, genetics, and growth cycles of cyanophages are reviewed, the interaction of their development with metabolism of the cyanophycean host is discussed, and ecological effects are considered. An extensive bibliography is included. (Mortland-Battelle)
W74-06754

HORIZONTAL PHYTOPLANKTON STUDIES IN LAKE BALATON BASED ON SCOOPED SAMPLES AND FILTRATES TAKEN IN 1967,
Magyar Tudomanyos Akademia, Tihany. Biological Research Inst.
G. Tamas.
Ann Inst Biol (Tihany) Hung Acad Sci. 39. p 151-188, 1972. Illus.
Identifiers: *Chlorophyta, *Chrysophyta, Cyanophyta, Euglenophyta, Filtrates, Lakes, Mycophyta, *Phytoplankton, Pyrrophyta, Seasonal, *Hungary(Lake Balaton), Sampling, Distribution.

In the period between April and Nov., 1967, 495 scooped samples and 117 net-filtrates from 15 sampling sites of 5 transversed sections were examined. Identified were 147 spp., 11 varieties and 2 forms belonged to 6 phyla according to the following distribution: Cyanophyta 18, Euglenophyta 11, Pyrrophyta,5, Chrysophyta 65, Chlorophyta 60, Mycophyta 1. The number of individuals and species (709,700/1) was the biggest in the Aug. collections from the Bay of Keszthely. The smallest number of species (44) and individuals (79,900) was registered in the Nov. collections of Balatonalmadi-Balatonvilagos and Sagpuszta-Balatonszemes, respectively. Chrysophytes had the highest values for both species and individual numbers as well as percentage in the summer samples taken in the Bay of Kaszthely. During 1967 the distribution of the phytoplankton in Lake Balaton (Hungary) was uniform both horizontally and seasonally.--Copyright 1973, Biological Abstracts, Inc.
W74-06756

AN EXAMINATION OF THREE STRAINS OF THE BLUE-GREEN ALGAL GENUS, FREMYELLA,
East Tennessee State Univ., Johnson City. Dept. of Biology.
J. T. Wyatt, T. C. Martin, and J. W. Jackson.
Phycologia, Vol 12, Nos 3/4, p 153-161, December 1973. 7 fig, 4 tab, 20 ref.

Descriptors: *Growth stages, *Cultures, *Metabolism, Behavior, *Plant morphology, *Cyanophyta, Systematics, Isolation, Sampling, Growth rates.
Identifiers: *Fremyella.

Placed in the family Scytonemataceae by some authorities and by others in the Microchaeteaceae, the blue-green algal genus Fremyella often exhibits seemingly paradoxical behavioral patterns. Its growth characteristics and its metabolic rates indicate the genus to be ecologically competitive. On the other hand, its infrequent occurrence in most experimental algal collections suggests just the opposite. Three strains of Fremyella produced widely different data which suggested that the genus probably occupies terrestrial, subaquatic, and aquatic systems. However, the results did not truly explain the rarity of the genus. (Little-Battelle)
W74-06759

THE GENUS NEOCHLORIS STARR (CHLOROPHYCEAE, CHLOROCOCCALES),
Slippery Rock State Coll., Pa. Dept. of Biology.
For primary bibliographic entry see Field 5A.
W74-06760

LEAD INHIBITION OF HORMOTILA BLENNISTA (CHLOROPHYCEAE, CHLOROCOCCALES),
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Botany.
T. J. Monahan.
Phycologia, Vol 12, Nos 3/4, p 247, December 1973. 1 tab, 8 ref. Grant No 07-2177.

Descriptors: *Lead, *Inhibition, *Plant growth, *Bioassay, Deficient elements, Heavy metals, *Soil algae, Chlorophyta, Pollutants, Cultures, Environmental effects, Light, Phosphates, Potassium, Nutrients.
Identifiers: Pollutant effects, Survival, *Hormotila blennista.

Hormotila blennista, a unicellular green soil alga, was cultured in modified Bristol's solution deficient in the potassium phosphate salts to which had been added the trace element mix of Watt and Fogg (1966) and known concentrations of lead chloride. Autoclave sterilization, axenic cultures, and sterile techniques were routinely used. After autoclaving, culture media ranged between pH 6.4 and 6.6. Cultures were grown in 50 ml of medium and incubated at 22 plus or minus 1.0C under continuous fluorescent illumination supplying 3000 to 4000 lux light intensity. Dark experiments were performed by placing cultures in sealed cardboard boxes in the growth chamber. Cells were harvested during the declining growth phase and counts made to determine the effect of lead on growth. When contrasted to control cultures, significant inhibition was noted in the light at all lead concentrations tested from 50-500 ppb (P less than 0.001) and in the dark at 50 ppb (P less than 0.01), and 100, 250, and 500 ppb (P less than 0.0001). It was concluded that the effects of lead among the algae may be particularly accentuated under stressful conditions of essential nutrient deficiency, such as phosphate and potassium as exemplified by H. blennista. (Holoman-Battelle)
W74-06761

GROWTH OF STREPTOCOCCUS CREMORIS AND STREPTOCOCCUS LACTIS IN A CHEMOSTAT. PRODUCTION OF CELLS AND SURVIVAL OF BACTERIA DURING FROZEN STORAGE,
National Research Council of Canada, Ottawa (Ontario). Div. of Biological Sciences.
I. J. McDonald, B. Reiter, and P. L. Rogers.
Canadian Journal of Microbiology, Vol 19, No 10, p 1285-1295, October 1973. 12 fig, 1 tab, 24 ref.

Descriptors: *Streptococcus, *Growth rates, *Cytological studies, *Cold resistance, Nutrients, Hydrogen ion concentration, Freezing, Cultures, Temperature, Limiting factors.
Identifiers: *Sample preservation, Survival, *Culture media, Viable count, Chemostat, Sample preparation.

Streptococcus cremoris HP and Streptococcus lactis 829 were grown in chemostats in tryptone yeast extract broth and in supplemented 2 percent skim milk medium. In both media, lactose was the limiting nutrient. Cultures were grown at various dilution rates in media poised at constant pH and temperature and also at constant dilution rates in media controlled at different pH levels and temperatures. The effects of the various conditions of growth of production of bacteria, viable counts, and acid-producing activities of cells and on the ability of bacteria to survive subsequent frozen storage were determined. None of the conditions of growth tested had very pronounced effects on the ability of cells to survive or on the inability of cells to retain acid-producing activity after being frozen at -70C and stored at -40C. (Mortland-Battelle)
W74-06762

OXIDATION OF N-ALKANES BY CLADOSPORIUM RESINAE,
Dayton Univ., Ohio. Dept. of Biology.
J. D. Walker, and J. J. Cooney.
Canadian Journal of Microbiology, Vol 19, No 10, p 1325-1330, October 1973. 3 fig, 3 tab, 29 ref.

Descriptors: *Cultures, *Microbial degradation, *Oxidation, Growth rates, Organic compounds, Organic acids, Oxygen demand, Metabolism, Alcohols.
Identifiers: Substrate utilization, *Biooxidation, *Cladosporium resinae, Dodecane, Hexadecane, Hexane, Hexanol, Hexanal, Dodecanal, Hexadecanal, Aldehydes, Cycloheximide, *Alkanes.

Cells of two hydrocarbon-using strains of Cladosporium resinae grown on glucose oxidize hydrocarbons without a lag when transferred to dodecane, hexadecane, or their primary alcohols, aldehydes, or acids. Cycloheximide does not limit oxygen uptake when cells are transferred from glucose to dodecane or hexadecane. Isocitrate lyase levels are not higher in alkane-grown cells than in glucose- or glutamic acid-grown cells. Glucose-grown cells have higher Q sub O2 values than hydrocarbon-grown cells when placed on dodecane or hexadecane. Thus, n-alkane-oxidizing enzymes are constitutive in C. resinae. Cells oxidize dodecanal and hexadecanal though they do not grow on them. Whole cells and cell-free preparations oxidize dodecane, hexadecane, and their primary alcohols and aldehydes, indicating that the oxygenated compounds may be intermediates in alkane oxidation. Hexane, which supports little growth, inhibits oxygen uptake of whole cells below the endogenous level, as do hexanol and hexanal, although cell-free preparations oxidize all three six-carbon compounds. Hexane inhibits oxygen uptake on hexadecane. Therefore, hexane does not appear to be transported into cells and may interfere with membrane function. (Little-Battelle)
W74-06763

MERCURY AS A HYDROSPHERIC POLLUTANT II. BIOLOGICAL HALF-TIME OF METHYL MERCURY IN FOUR MEDITERRANEAN SPECIES: A FISH, A CRAB, AND TWO MOLLUSCS,
International Lab. of Marine Radioactivity, Monte Carlo (Monaco).
J. K. Miettinen, M. Heyraud, and S. Keckes.
Paper presented at FAO Technical Conference on Marine Pollution and its Effects on Living

Resources and Fishing, No FIR:MP/70/E-9, November 5, 1970. 8 p, 2 fig, 1 tab, 30 ref.

Descriptors: *Mercury, *Bioassay, Marine fish, *Molluscs, *Crabs, *Metabolism, *Radioisotopes, Pollutants, Metals, Environmental effects, Aquatic animals, Analytical techniques, Organic compounds, Testing, Laboratory tests, Sampling.
Identifiers: Serranus scriba, Carcinus maenuas, Tapes decussatus, Mytilus gallo provincialis.

Fish (Serranus scriba), decapod crabs (Carcinus maenuas), and two types of bivalve molluscs (Tapes decussatus and Mytilus gallo provincialis) were taken from the Ligurian Sea in order to ascertain whether their excretion of methyl mercury follows similar rates and routes as in parallel species from brackish and fresh waters. A mercury radioisotope was administered to the animals as methylmercury nitrate and initial loss and slow loss were measured by whole body counting with scintillation counters. The counting error was estimated to remain below plus or minus 2%. All the comparative analyses point to a similar pattern of excretion rates in fresh water, brackish and marine organisms. Generally a large fraction of the administered compound has a slow loss rate. The biological half-time depends on the method of methyl mercury's entry into the organism, being longer after intramuscular injection than after peroral administration. (Jerome-Vanderbilt)
W74-06767

INTERACTION OF TEMPERATURE AND COPPER IONS AS ORIENTING STIMULI IN THE LOCOMOTOR BEHAVIOR OF THE GOLDFISH (CARASSIUS AURATUS),
Texas A and M Univ., College Station. Dept. of Biology.
H. Kleerekoper, J. B. Waxman, and J. Matis.
Journal of the Fisheries Research Board of Canada, Vol 30, No 6, p 725-728, 1973. 3 fig, 1 tab, 3 ref. EPA Project 18050 DWQ.

Descriptors: *Temperature, *Copper, *Fish behavior, Heat, Light, Swimming, Heavy metals, Time, Movement, Laboratory tests, Water pollution effects, Fish attractants.
Identifiers: *Sub-lethal effects, *Goldfish.

Movements of single goldfish (Carassius auratus) were monitored in a free choice situation comprising zones of laboratory water or copper-containing water (0.01 ppm as CuCl2) each at two temperatures, 21.1 plus or minus 0.1 and 21.5 plus or minus 0.1C. The interaction between the copper ion proper and the gradient of copper concentration creates stimulus conditions that cannot be accounted for by the concentration of copper ions alone. This experiment was performed to ascertain whether a similar interaction occurs between copper and temperature in their combined effect on the orientation of locomotion in the goldfish. The experiments were carried out in an acrylic tank kept under constant light. The tank was divided into 16 parts leaving an open area in the center. The data representing the number of photoelectric gates triggered by the fish and the time of entry or departure were punched on paper tape and transposed to magnetic tape for computer processing. Fish entered the copper zone at 21.1C significantly less frequently and spent less time there per entry as compared to the copper-free zone ('avoidance behavior'). The copper zone at 21.5C became significantly 'attractive' to the fish in terms of both frequency of entry and time spent. The effects of copper ion and of the temperature were based on an analysis of variance. The presence of the copper ions in the absence of heat brings about a significant decrease in both percentage of entries and time spent per entry. Temperature rises in the presence of copper produced an increase in both the percentage of the entries into the compartment and the time spent per entry. (Tirfie-Vanderbilt)
W74-06769

ENVIRONMENTAL MERCURY CONTAMINATION.
For primary bibliographic entry see Field 5B.
W74-06770

MERCURY IN FISH IN THE GREAT LAKES,
Michigan Dept. of Natural Resources, Lansing. Fish Div.
For primary bibliographic entry see Field 5B.
W74-06774

SURVEY OF MERCURY CONCENTRATIONS IN FISHES OF LAKES ST. CLAIR, ERIE, AND HURON,
Bureau of Commercial Fisheries, Ann Arbor, Mich. Technological Lab.
For primary bibliographic entry see Field 5B.
W74-06775

MERCURY IN WILD ANIMALS, LAKE ST. CLAIR, 1970,
Bureau of Sport Fisheries and Wildlife, Laurel, Md. Patuxent Wildlife Research Center.
For primary bibliographic entry see Field 5B.
W74-06776

MERCURY LEVELS IN A SAMPLE OF MICHIGAN RESIDENTS,
Michigan Dept. of Public Health, Lansing.
For primary bibliographic entry see Field 5B.
W74-06782

MERCURY IN HUMANS IN THE GREAT LAKES REGION,
Ontario Dept. of Health, Toronto. Environmental Health Services Branch.
For primary bibliographic entry see Field 5B.
W74-06783

THE OCCURRENCE OF MERCURY IN THE ENVIRONMENT AND MAN, DISCUSSION PAPER,
Michigan Dept. of Natural Resources, Lansing.
For primary bibliographic entry see Field 5B.
W74-06784

THE ROLE OF FOOD CHAINS IN ENVIRONMENTAL MERCURY CONTAMINATION,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 5B.
W74-06795

MERCURY AND FOOD CHAINS,
Institute for Water and Air Pollution Research, Stockholm (Sweden).
For primary bibliographic entry see Field 5B.
W74-06796

RESEARCH NEEDS: STUDY OF THE ENVIRONMENTAL DYNAMICS OF MERCURY,
Michigan Univ., Ann Arbor. Dept. of Environmental and Industrial Health.
For primary bibliographic entry see Field 5B.
W74-06798

ENVIRONMENTAL DYNAMICS OF MERCURY: DISCUSSION PAPER,
Rochester Univ. N. Y.
For primary bibliographic entry see Field 5B.
W74-06799

DOSE-RESPONSE RELATIONSHIP ASSOCIATED WITH KNOWN MERCURY ABSORPTION AT LOW DOSE LEVELS OF INORGANIC MERCURY,
Michigan Univ., Ann Arbor. School of Publich Health.
R. G. Smith.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 207-222, 1972, 5 tab, 4 fig, 17 ref.

Descriptors: *Mercury, Air pollution, *Public health, *Industrial plants, *Air pollution effects, Pollutants, Heavy metals, Environmental effects, Human pathology, Toxicity, Testing, Sampling, Data collection, Evaluation.
Identifiers: *Industrial hygiene.

Approximately 75 to 85% of mercury inhaled is absorbed and this is the primary source of mercury entering the body. Mercury is oxidized in the blood with major accumulations occurring in the brain with possible effects on the central nervour system. No clinical evidence of mercurialism was found among workers exposed to less than 100 micrograms of mercury per cubic meter of air. Mercury studies performed in large chlorine plants to determine dose-response relationships are reported. Environmental mercury in all the plants sampled was measured and information about 567 employees was collected. Age distribution, length of employment and cigarette smoking habits of the employees were compared with mercury levels to develop time-weighted averages for exposure. The employees examined were in good health and in no way distinguishable from the control population in comprehensive tests. There was a somewhat higher incidence of a number of neuropsychiatric symptoms, based on subjective responses. (See also W74-06770) (Jerome-Vanderbilt)
W74-06800

SURFACE ELECTROMYOGRAPHY IN CHRONIC INORGANIC MERCURY INTOXICATION,
Michigan Univ., Ann Arbor. Dept. of Industrial Engineering.
D. B. Chaffin, and B. D. Dinman.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 222-229, 1972.

Descriptors: *Mercury, *Air pollution, *Human pathology, *Toxicity, Pollutants, Heavy metals, Air pollution effects, Public health, Laboratory tests, Measurement, Evaluation, Analytical techniques.
Identifiers: *Electromyography, *Occupational health, Industrial hygiene.

In August 1970 a survey by the Institute of Environmental and Industrial Health of a tungsten-carbide alloy recovery facility indicated high airborne concentrations of mercury which would present a probable health hazard. The four employees of this shop were subjected to medical examination, including an electromyographic evaluation of their muscle action potential. This system presents a graphical and numerical plot of the amplitude of the different complex muscle action components which are reported as a histogram and compared to developed power spectra norms. The production worker and the owner of the firm showed signs and symptoms of chronic mercurialism, including loss of appetite and weight, impaired sleep, nightmares, ease of fatigue and personality changes. The spectral analysis of the electromyograms revealed signal abnormalities in both patients. Application of this method to a population with less chronic exposure needs further investigation. Factors such as drugs and medications, concomitant pathological states, physical fitness, and recent physical work affect the electromyographic record. (See also W74-06770) (Jerome-Vanderbilt)
W74-06801

BIOTRANSFORMATION OF ORGANO-MERCURIALS IN MAMMALS,
Rochester Univ., N.Y. Dept. of Radiation Biology; and Rochester Univ., N. Y. Dept. of Biophysics.
T. W. Clarkson.

In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 229-238, 1972. 3 tab, 1 fig, 23 ref.

Descriptors: *Mercury, *Human pathology, *Metabolism, Pollutants, Human diseases, Toxicity, Organic compounds, Inorganic compounds, Laboratory tests, Chemical reactions, Evaluation, Investigations, Measurements, Public health, Heavy metals.
Identifiers: *Biotransformation, *Organomercurials, Methylation, Diuretics.

Two major pathways of biotransformation of organo-mercurials are discussed: (1) a cleavage of the mercury bond resulting in the release of inorganic mercury; (2) a chemical change in the organic moiety resulting in a modified organo-mercuric compound which further reacts and leads to the eventual release of inorganic mercury. It is known that inorganic mercury is accumulated by kidney tissue, thus relative rates of biotransformation may be obtained by comparing the fraction of inorganic mercury in kidneys after single doses of different organo-mercurial compounds. The possibility that the release of inorganic mercury from organo-mercurial compounds accounts for the toxicity of those compounds is discussed. The distribution of mercury was examined and it was found that inorganic mercury is accumulated and stored in the cortical tissue of the kidneys. Since mercurial diuretics are excreted much more rapidly than inorganic mercury, biotransformation of these compounds to inorganic mercury will result in increased retention of mercury in the body. The phenyl and methoxyethyl mercurials appear to be excreted at approximately the same rate as inorganic mercury. (See also W74-06770) (Jerome-Vanderbilt)
W74-06802

THE BINDING OF INORGANIC AND ORGANIC MERCURY COMPOUNDS (HG 203) TO CONSTITUENTS OF NORMAL HUMAN BLOOD,
Creighton Univ., Omaha, Nebr.
H. A. Guirgis, W. K. Stewart, and W. Taylor.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 239-246, 1972. 3 fig, 5 tab, 4 ref.

Descriptors: *Mercury, *Radiochemical analysis, *Metabolism, *Human pathology, *Proteins, Dialysis, Pollutants, Heavy metals, Inorganic compounds, Organic compounds, Analytical techniques, Separation techniques, Biochemistry, Electrophoresis, Public health.
Identifiers: *Organomercurials, *Human blood, Clinical studies.

The relative uptake of 203 Hg-labelled mercuric chloride (Hg Cl2), phenylmercuric acetate (PMA) and methylmercuric nitrate (MMN) by normal human blood, was studied in vitro. The uptake of HgC12, PMA, and MMN by erythrocytes and plasma varied from one compound to another. Binding of mercury compounds to the serum proteins was confirmed, using both dialysis and gel-filtration techniques. Electrophoretic separation of the mercuric compound and serum mixture was utilized to identify the protein fraction which binds each of the mercuric compounds in vitro. In vivo inhibition of glutathione reductase, phosphoglucose isomerase, glucose-6-phosphate dehydrogenase and caeruloplasmin were affected by mercuric chloride, phenylmercuric acetate and mersalyl. (See also W74-06770) (Jerome-Vanderbilt)
W74-06803

BIOLOGICAL REACTIONS AND PATHOLOGICAL CHANGES IN HUMAN BEINGS AND ANIMALS CAUSED BY ORGANIC MERCURY CONTAMINATION,
Kumamoto Univ. (Japan). Medical School.
T. Takeuchi.

In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 247-289, 1972. 15 fig, 11 tab, 76 ref.

Descriptors: *Mercury, *Human pathology, *Animal pathology, *Public health, Pollutants, Toxicity, Environmental effects, Absorption, Organic compounds, Inorganic compounds, Water pollution, Diseases, Biology, Water pollution sources, Investigations.
Identifiers: *Methylation, *Japan(Minamata disease).

A summary is presented of mercury pollution in water, its effects on the human and animal populations and the absorption of mercury by different organs. The major sources of methylmercury in water are discharges from acetaldehyde manufacturing plants, use of mercuric agricultural products, and the formation of methylmercury chloride. The effects of mercury poisoning were studied in the areas of Niigata and Minamata Bay after hazardous concentrations were found in water there. The three major pathological symptoms of the disease are cerebellar ataxia, constriction of visual fields and dysarthria. In fetal cases of the disease disturbances of mental and motoric development result. In animals, notably cats, unsteady and slow movement, atoxic gait and paroxysmal convulsions were the main symptoms. Postmortem liver, kidney and brain tissue from humans who suffered from acute and sub-acute cases of Minamata disease had high mercury content. The various effects of methylmercury and alkyl mercury on tissue cells were tested and reported. (See also W74-06770) (Jerome-Vanderbilt)
W74-06804

THE DOSE-RESPONSE RELATIONSHIP RESULTING FROM EXPOSURE TO ALKYL MERCURY COMPOUNDS,
Michigan Univ., Ann Arbor. School of Public Health.
B. D. Dinman, and L. H. Hecker.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 290-301, 1972. 4 tab, 20 ref.

Descriptors: *Mercury, *Diets, *Toxicity, *Metabolism, *Human pathology, Pollutants, Inorganic compounds, Organic compounds, Public health, Foods, Investigation, Poisons, Lethal limits, Heavy metals.
Identifiers: Blood, Hair.

A review of the human dose-response relationship resulting from exposure to alkylmercury compounds is presented on the basis of available literature. The normal range of mercury loading in populations which live in uncontaminated areas and have diets which do not include contaminated fish is presented. This level is considered to be 10 micrograms or less per day. The mercury levels in blood were compared to those in hair. The normal mercury level in blood is considered to be between 0.5 micrograms and 1.0 microgram per 100 ml of whole blood. The blood mercury levels of 8 patients with obvious symptoms of mercury intoxication were between 290 and 440 micrograms per 100 ml of blood. The whole blood mercury concentration in a case of fatal mercury poisoning was estimated to 400 micrograms per 100 ml blood. It appears that alkylmercury levels of up to 100 micrograms per 100 ml blood are not clearly associated with readily detectable deleterious effects. The problems associated with the detection of minimal alkyl mercury intoxication are discussed and recommendations are made. (See also W74-06770) (Jerome-Vanderbilt)
W74-06805

THE RELATIONSHIP BETWEEN MERCURY CONCENTRATION IN HAIR AND THE ONSET OF MINAMATA DISEASE,
Kumamoto Univ. (Japan). School of Preventive Medicine.
T. Takeuchi.

In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 302-304, 1972. 2 fig, 2 ref.

Descriptors: *Mercury, *Human pathology, *Laboratory tests, Pollutants, Toxicity, Biochemistry, Metabolism, Poisons, Water pollution, Environmental effects, Diseases, Analytical techniques, Chemical analysis, Lethal limit, Pathology.
Identifiers: *Minamata disease, Hair, *Japan(Niigata).

A close relationship between mercury concentrations in human hair and mercury poisoning was discovered during investigations of mercury contamination in Niigata. Results from those investigations are presented. Mercury intoxication was evident in individuals whose hair contained from 52 to 570 ppm mercury. Some of the individuals who had high mercury concentrations in their hair were not affected by mercury intoxication. In Minamata, some clinical signs of mercury poisoning were observed in individuals with only 10 - 20 ppm mercury in their hair. Some factors indicate a greater inherent sensitivity of the fetus than of children or adults to organic mercury loadings. (See also W74-06770) (Jerome-Vanderbilt)
W74-06806

ORGANIC MERCURY POISONING IN ALAMOGORDO, NEW MEXICO,
New York State Dept. of Health, Albany.
A. Hinman.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 304-305, 1972. 1 tab.

Descriptors: *Mercury, *Human pathology, *Poisons, *Seed treatment, Pollutants, Toxicity, Biochemistry, Metabolism, Food, Diets, Food chains, Diseases, Public health, Treatment, Analysis, Pathology, *New Mexico.
Identifiers: *Methylation, Poisoning.

In a case of mercury poisoning in Alamogordo, New Mexico three children were affected after eating contaminated meat. Their father, a farmer, had obtained seed grain which had been treated with methylmercury dicyandiamide to feed his stock. A hog which had eaten the grain was butchered and eaten by the family. The hog's meat contained 27.5 ppm of mercury. The three children were treated with British anti-lewisite (BAL) to increase urinary mercury excretion and also with n-acetyl-d, l,-penicillamine but no clinical improvement was noted. After about three to four months, gradual improvement was observed but all three patients remained severely impaired. (See also W74-06770) (Jerome-Vanderbilt)
W74-06807

SURVIVAL AND REPRODUCTION OF RING-NECKED PHEASANTS CONSUMING TWO MERCURIAL FUNGICIDES,
Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.
W. J. Adams, and H. H. Prince.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 306-317, 1972. 8 fig, 1 tab, 14 ref.

Descriptors: *Mercury, *Mortality, *Reproduction, *Birds, *Food chains, *Seed treatment, Pollutants, Toxicity, Growth rates, Organic compounds, Inorganic compounds, Analysis, Laboratory tests, Animal pathology.
Identifiers: Methylmercury, Poisoning, Pheasants.

The effects of two mercurial fungicides used in seed treatment, methylmercuric dicyaniamide and phenylmercuric acetate, on the survival and reproduction of pheasants were investigated. Two groups of birds were fed food treated with different concentrations of the two compounds, daily

and at three day intervals respectively. Eggs were collected, stored and incubated and chicks were weighed, banded, and placed in brooder houses. All birds fed untreated food survived. One of the 11 hens fed phenylmercury died during the 74 day test period. Ten of the hens fed methylmercury died, and it appeared that a cumulative consumption level of about 24.7 mg of methylmercury was fatal with signs of mercury poisoning occurring between 13 to 17 mg. Egg production of hens fed methylmercury declined, beginning in the second week. Although no decline was observed for hens fed phenylmercury, both compounds had an adverse effect on hatchability. The amount of embryonic mortality during the first 14 days of development was 70%, 62%, and 48% for methylmercury, phenylmercury, and control groups respectively. Consumption of more than 4 mg of methylmercury would seriously decrease hatchability. Consumption of 16 mg of methylmercury or more would result in cessation of egg production in pheasant hens. (See also W74-06770) (Jerome-Vanderbilt)
W74-06808

DOSE-RESPONSE RELATIONSHIPS AFTER EXPOSURE OF SWINE TO ORGANO-MERCURIAL COMPOUNDS,
Saskatchewan Univ., Saskatoon. Western Coll. of Veterinary Medicine.
L. Tryphonas.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 318-319, 1972.

Descriptors: *Hogs, *Mercury, *Poisoning, *Toxicity, *Laboratory tests, Pollutants, Organic compounds, Inorganic compounds, Environmental effects, Human pathology, Analysis, Chemical analysis, Diseases, Public health, Lethal limit, Biochemistry, Measurement.
Identifiers: *Organomercurials.

The effects of methyl mercuric dicyandiamide (MMD), ethyl mercuric chloride (EMC) and phenyl mercuric chloride (PMC) on swine were investigated, to find the levels at which mercury poisoning became evident. The daily dosages ranged from 0.19 to 4.56 mg of mercury per kg. MMD produced clinical disease at about 0.76 mg Hg/kg/day, EMC produced disease at about 0.38 mg Hg/kg/day and PMC caused predominantly kidney damage with signs of disease only above 2.28 mg Hg/kg/day. The alkyl mercury compounds affect the brain, causing decrease in cerebrum volume and cytolysis of neurons. The effect of alkyl mercury compounds on the kidneys is not severe. This study confirms a relatively high toxicity to swine of alkyl mercury compounds as compared to aryl mercury compounds. The accumulation of mercury compounds in certain organs of swine become a hazard to public health. (See also W74-06770) (Jerome-Vanderbilt)
W74-06809

DETECTION AND APPRAISAL OF SUBCLINICAL INTOXICATIONS,
Duke Univ. Medical Center, Durham, N.C.
L. J. Goldwater.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 319-325, 1972. 2 fig, 4 tab, 10 ref.

Descriptors: *Mercury, *Human pathology, *Toxicity, *Biochemistry, Pollutants, Inorganic compounds, Organic compounds, Poisons, Analysis, Proteins, Analytical techniques, Public health, Enzymes, Heavy metals, Pathology, Pollutant identification, Path of pollutants.
Identifiers: *Subclinical effects, Clinical studies.

The inadequacies of some of the present methods of determining subclinical levels of mercury intoxication are reviewed and areas of research which may yield more exact evaluations are suggested. Methods such as testing the blood and urine mercury levels prove inadequate because there is no critical level of mercury regularly associated with them. Often, by the time significantly increased levels are observed, biological damage has already occurred. The low grade absorption of some mercury compounds may result in a slight increase in excretion of protein but detection methods are complex and do not lend themselves to simple tests. Some biochemical tests which are based on the affinity of mercury for sulfhydryl-containing enzymes have been investigated and show promise. Coproporphyrins, delta-aminolevulinic acid, lactose dehydrogenase, serum phosphoglucose isomerase and serum gluthathione reductase are some of the substances which have been studied. It is suggested that mercury, like several other heavy metals, may be beneficial to the biological processes at very low levels, but toxic in higher concentrations. Further investigation of low levels of mercury and its enzymatic functions is necessary in order to understand subclinical intoxication. (See also W74-06770) (Jerome-Vanderbilt)
W74-06810

APPROACHES TO THE DETECTION OF SUBCLINICAL MERCURY INTOXICATIONS: EXPERIENCE IN MINAMATA, JAPAN,
Kumamoto Univ. (Japan). Medical School.
T. Takeuchi.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 325-328, 1972. 1 fig, 3 ref.

Descriptors: *Mercury, *Organic compounds, *Human pathology, *Toxicity, *Subclinical effects, Pollutants, Inorganic compounds, Poisons, Environmental effects, Analytical techniques, Water pollution, Testing procedures, Diseases, Public health, Pathology, Mortality, Industrial wastes.
Identifiers: *Japan, Subclinical effects, Minamata disease, Methylmercury, Clinical tests.

Pathological findings indicated three types of Minamata disease. The first was a complete type of Hunter-Russell's syndrome; the second was incomplete with only one of the basic symptoms exhibited; and the third was a latent type which showed none of the clinical symptoms. This evidence indicated that there were problems with differential diagnosis which resulted from incomplete or masked symptoms. The pathological changes which occurred were the disappearance of granular cells in the cerebellum under the Purkinje layer and a decrease in the nerve cells of both calcarine regions. These stages were found even in patients who exhibited no clinical symptoms. Sural nerve biopsy has been proposed as most useful for diagnosis with mercury determination, because this nerve tends to be most easily disturbed in sensory peripheral nerves. Visual microscopic examination reveals a relative increase of smaller fiber, below 3 microns, and a decrease of normal size fibers, with collagen proliferation. The correlation between Minamata disease and mercury concentrations in hair indicates that this may be a useful diagnostic tool. (See also W74-06770) (Jerome-Vanderbilt)
W74-06811

EPIDEMIOLOGICAL APPROACHES TO THE STUDY OF SUBCLINICAL EFFECTS OF MERCURY INTOXICATION,
Michigan Univ., Ann Arbor. School of Public Health.
For primary bibliographic entry see Field 5B.
W74-06813

BIOLOGICAL EFFECTS OF MERCURY COMPOUNDS, DISCUSSION PAPER,
Rochester Univ., N. Y.
T. W. Clarkson, B. D. Dinman, J. C. Gage, L. J. Goldwater, and H. Guirgis.
In: Environmental Mercury Contamination, Ann Arbor Science Publishers, Inc., Michigan, p 341-345, 1972. 4 ref.

Descriptors: *Mercury, Reviews, *Toxicity, *Distribution, *Absorption, *Human pathology, Pollutants, Inorganic compounds, Organic compounds, Analytical techniques, Poisons, Diseases, Testing procedures, Biochemistry, Diets, Food chains, Heavy metals, Water pollution.
Identifiers: *Methylation, Subclinical effects, Accumulation, Minamata disease.

Although early studies of the toxicity of inorganic and organic mercury and mercury vapor supplied much valuable information, there are many problems remaining in measuring objectively the effects of the substances at a threshold level. Differences in the absorption and distribution of ionic mercury and metallic mercury vapor are discussed. The possibility of inorganic mercury undergoing methylation in man is unlikely. The stabilities of different organo-mercury compounds in vivo vary, as do their toxicities. The inhibition of the oxygen-carrying capacities of hemoglobin resulting from some forms of mercury intoxication may stimulate hemoglobin production. Fetal and infant mercury intoxication is discussed, based on information from Minamata and Niigata studies. The most important difference between inorganic and methylmercury poisoning is the irreversibility of the neurological symptoms which accompany methylmercury poisoning. Analysis of hair may be a good system for monitoring mercury levels in humans. Although detection of subclinical intoxications by methylmercury is difficult, new methods must be developed because of the irreversible nature of the disease. (See also W74-06770) (Jerome-Vanderbilt)
W74-06814

THE EXREM III COMPUTER CODE FOR ESTIMATING EXTERNAL RADIATION DOSES TO POPULATIONS FROM ENVIRONMENTAL RELEASES,
Oak Ridge National Lab., Tenn. Radiation Shielding Information Center.
For primary bibliographic entry see Field 5B.
W74-06818

AQUATIC VEGETATION OF THE OTTOWA RIVER NEAR CHALK RIVER NUCLEAR LABORATORIES (CRNL),
Atomic Energy of Canada Ltd., Chalk River (Ontario). Chalk River Nuclear Labs.
S. R. Gentner.
Available from NTIS, Springfield, Va., as Rept. No. AECL-4511. $4.00 in paper copy, $1.45 in microfiche.

Descriptors: *Survey, *Aquatic plants, Rivers, Vegetation, Data collections, *Nuclear powerplants, Effluents, Water pollution, Ecology, Radioecology, *Radioactivity effects, Research and development, *Food chains, Public health, *Canada.
Identifiers: *Ottawa River(Canada).

In the summer of 1972 a preliminary survey of the aquatic vegetation in the Ottawa River near the Chalk River Nuclear Laboratories from the Pump House downstream to Pte. au Bapteme on the Ontario side was undertaken. Maps showing the distribution of the vegetation along the shoreline and in the water were drawn up, and a checklist of all the vascular plants found was compiled. A complete survey of the aquatic vegetation may be viewed as the first step towards studying the changing patterns of aquatic vegetation due to activities at CRNL, as a means of identifying local plants for experimental use, as a means of learning the primary producers in the aquatic food chains of the river, and as the basis for future radioecological studies. (Houser-ORNL)
W74-06819

ENVIRONMENTAL SCIENCES DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING SEPTEMBER 30, 1973,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-06826

ENERGETICS OF DAPHNIA AMBIGUA,
Kansas Water Resources Research Inst., Manhattan.
K. B. Armitage.
Available from the National Technical Information Service as PB-231 356, $3.25 in paper copy, $1.45 in microfiche. Contribution No. 129, December 1973. 27 p, 7 tab, 16 ref. OWRR A-043-KAN(1). 14-31-0001-3516.

Descriptors: *Daphnia, *Seston, *Nitrogen, *Growth rates, *Kansas, Population, Chlorophyll, Akalinity, Photosynthesis, Zooplankton, Aquatic animals, Phosphates, Ponds, Growth stages, Temperature.
Identifiers: *Oxygen consumption, *Filtering rate(Daphnia), Orthophophates, Nitrate nitrogen.

The population cycle of the zooplankten D. ambigua was followed in a one hectare pond at the University of Kansas. D. parvula and D. pulex also occur in the same pond. D. ambigua predominates during the colder season from November through early June when water temperatures are below 20 degrees C. The population peak of D. ambigua in May is followed by that of D. pulex and then D. parvula. Growth of D. ambigua was measured under field and laboratory conditions. Both the time of egg development to hatching and of first instar to adult were slower at lower environmental temperatures. At the same temperature developmental times were shorter in the laboratory. The maximum size was smaller at each higher temperature over a temperature range of 6.5 to 26.6 degrees C. Clutch size decreased markedly at temperatures above 15 degrees C. Metabolic rates were consistent with rates measured under laboratory regimes of temperature acclimation. The filtering rate was higher at higher temperatures; large animals had higher filtering rates than small animals at low temperatures but had lower filtering rates than small animals at high temperatures. D. ambigua filtered particles of 2 to 5.04 microns in diameter. Gross photosynthetic rate, seston concentration, and chlorophyll a concentration were determined as measures of food available to the daphnid populations. Orthophosphate generally was high; nitrogen in the form of ammonia exceeded nitrate nitrogen; total alkalinity was low in summer and fall and high in winter and spring. These results will be used to calculate an energy budget for the D. ambigua population.
W74-06831

DISTRIBUTION OF AUTOTROPHIC NITRIFYING BACTERIA IN A POLLUTED STREAM,
Rutgers - The State Univ., New Brunswick, N.J. Dept. of Environmental Science.
M. S. Finstein, and V. A. Matulewich.
Available from the National Technical Information Service as PB-231 357, $3.75 in paper copy, $1.45 in microfiche. Water Resources Research Institute, New Brunswick, New Jersey, February, 1974. 61 p, 2 fig, 28 tab, 41 ref. OWRR A-030-N.J.(2). 14-01-0001-3230.

Descriptors: *Nitrification, Water pollution effects, *Microbial degradation, Environmental effects, Nitrates, Microorganisms, Path of pollutants, *Oxygen demand, *New Jersey.
Identifiers: Nitrosomonas, Nitrobacter, *Nitrogenous oxygen demand, *Nitrifying bacteria, *Passaic River(N.J.), Environmental surfaces, Microbial ecology.

The nitrogenous oxygen demand exerted by sewage and secondarily treated effluent may seriously lower the water quality of receiving streams. Comprehensive stream management requires the ability to predict where this component of the oxygen demand will be exerted, and at what rate. Efforts to include nitrification in stream models are unlikely to be highly successful without some understanding of the ecology of the responsible organisms. The present investigation was undertaken to provide such information. The distribution of nitrifying bacteria in bulk waters, on surfaces, and in muds at 11 Passaic River sites was studied using most-probable-number procedures. In mud samples taken from the mud-water interface, nitrifiers were from 21 to 140,000 (average 515) times more abundant (volumetrically) than in the overlying waters. Nitrifiers were found throughout a 21 cm profile of mud, the highest densities occurring in the topmost levels. Large numbers of these bacteria were associated with aquatic plants, algae, and slimes on rocks. There was no correlation between nitrifier density and river flow. Ammonium-oxidizers outnumbered nitrite-oxidizers in all but one of the 112 samples examined by a factor from 1.7 to 5310 (average 20.9). These data suggest that high river velocities may bring into suspension substantial numbers of nitrifiers. The relative scarcity of nitrifying bacteria in bulk waters and their abundance at surfaces is suggestive that surfaces may be the more important site of nitrification in rivers. (Whipple-Rutgers)
W74-06834

BASIC RESEARCH IN THE AQUATIC ENVIRONMENT: EFFECTS OF EUTROPHICATION ON PHYTOPLANKTON POPULATIONS AND SELECTED SPECIES OF AQUATIC VASCULAR PLANTS,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
H. F. Mulligan.
Available from the National Technical Information Service as PB-231 358, $3.25 in paper copy, $1.45 in microfiche. Completion Report, December 1973. 43 p, 3 fig, 7 tab, 21 ref. OWRR B-011-NY(1). 14-01-0001-1533.

Descriptors: *Aquatic weed control, *Eutrophication, *Nutrient removal, *Pollution abatement, *Water pollution control, *Water pollution effects, Aquatic weeds, Aquatic productivity, Nitrogen, Phosphorus, *Phytoplankton, Pollutants, Ponds, Soil-water plant relationships, Water Chemistry.
Identifiers: Experimental ponds, Phytoplankton-aquatic weed interactions, Fertilizer pollution.

Planktonic algae and benthic plants are in direct competition. An increase in one component usually is accompanied by a decline in the population of the other. Continuous fertilization with N and P above the level of .05 mg N/l and .005 mg P/l leads to a dominance in the summer phytoplankton population. A cessation and enrichment causes the plant population to return to natural levels. The concentrations of P-PO4 remain high and it appears that nitrogen is the more limiting of the two elements under natural conditions. Prolonging the cover of the ice has the same consequence as adding additional nitrogen to the water. Elodea canadensis and Potamogeton crispus are favored by high nutrient levels whereas Chara sp., Myriophyllum spicatum var. exalbescens and Ceratophyllum demersum are eliminated. Although aquatic environments can recover rapidly from enrichment and re-establish near normal vegetation conditions, they are liable to be easily disturbed by unusual natural occurrences such as prolonged ice cover due to exceptionally cold winters.
W74-06835

THE RUNOFF OF WATER AND NUTRIENTS FROM WATERSHEDS TRIBUTARY TO CAYUGA LAKE, NEW YORK,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 5B.
W74-06848

WATER AND NUTRIENT BUDGETS FOR CAYUGA LAKE, NEW YORK,
Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.
For primary bibliographic entry see Field 5B.
W74-06849

ENVIRONMENTAL ASPECTS OF PLUTONIUM AND OTHER ELEMENTS, A SELECTED ANNOTATED BIBLIOGRAPHY.
Oak Ridge National Lab., Tenn.
Aval: NTIS, Springfield, Va., as Rept. No. EIS-74-21 (Suppl. 2); $7.60 per copy, $1.45 microfiche. Report No. ORNL-EIS-74-21 (Supp. 2), February 1914. 282 p, 438 ref, 1 append, 7 indexes.

Descriptors: *Monitoring, *Environment, *Plutonium, *Ecology, *Ecosystems, *Bibliographies, Bioassay, Biological communities, Chemical properties, Physical properties, Radiation, Radioecology, Radioactive waste disposal, Nuclear explosions, Water pollution, Soil contamination.
Identifiers: *Nevada Test Ste.

This third published bibliography of 438 references from the computer information file built to provide support to its sponsor, the Nevada Applied Ecology Group of the AEC Nevada Operations Office, emphasizes the early (before 1962) unclassified and declassified literature that concerns plutonium, uranium, and the Nevada Test Site (NTS). Included are environmental aspects of the nuclear devices tested at the NTIS, supporting investigations that provide background information on the Test Site, such as basic studies of the flora, fauna, and geology of that area, and basic biological and medical studies on the effects of plutonium and uranium, particularly as they relate to health considerations for man. Every reference provides an abstract. Abstracts are findings-oriented. Additional numerical data are included in a special field or referred to in the comment field. Indexes are given for author, subject category, keywords, geographic location, permuted title, taxons, and publication description. (Houser-ORNL)
W74-06857

THE CHALLENGE OF MILITARY NUCLEAR CONSTRUCTION,
Army War Coll., Pa. Carlisle Barracks, Pa.
For primary bibliographic entry see Field 8H.
W74-06859

BEHAVIOR OF RADIOIODINE IN THE ENVIRONMENT AND IN MAN,
Comitato Nazionale per l'Energia Nucleare, Ispra (Italy). Division Protezione Sanitaria e Controlli.
For primary bibliographic entry see Field 5B.
W74-06862

THE EFFECTS OF WASTE DISPOSAL IN THE NEW YORK BIGHT. SECTION 3: ZOOPLANKTON STUDIES.
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Sports Fisheries Marine Lab.
Available from the National Technical Information Service as AD-739 533, $1.45 in microfiche. Final Report, February 1972. 115 p, 157 fig, 12 tab, 500 ref.

Descriptors: *Waste disposal, *Water pollution effects, *Zooplankton, *Copepods, *Acids, *Chemical wastes, Crustaceans, Heavy metals, Drifting(Aquatic), Sewage sludge, Bioindicators, Larvae, Biochemical oxygen demand, Dissolved oxygen, Industrial wastes, Systematics, Ecological distribution, Seasonal, Annelids, Mollusks, Marine animals, Animal pathology.
Identifiers: *New York Bight, Finfish, Bivalves, Oithona spp, Paracalanus spp, Pseudocalanus minutus, Centropages spp, Temora spp, Tortanus discaudatus, Acartia clausii, Acartia tonsa, Acar-

tia longiremis, Eurytemora, Labidocera aestiva, Calanus finmarchicus, Carycaeus spp, Oncea spp, Candacia armata, Metridea lucens, Clytemestra, Centropages typicus, Centropages hematus, Temora stylifera, Temora longicornis, Paracalanus parvus.

A comparative zooplankton study was undertaken as part of a multi-disciplinary study of the effects of offshore waste disposal on the waters of the New York Bight. The emphasis has been placed on copepods because they occur in this area the year round and are usually the principal constituent of zooplankton. Samples were collected by net towing (0.5m diameter, No. 8 mesh) at surface, mid-, and bottom depths at 15 stations and preserved in 4 percent buffered formaldehyde. Laboratory counts were made by diluting the samples to a known volume, mixing until a uniform suspension occurred, and then removing 1 ml subsamples until at least 300 copepods were tallied and identified. Settled and displacement volumes were measured; organisms greater than 15 mm in diameter were not included in the displacement volume. In conjunction with the zooplankton samples, total iron, nitrate and three kinds of phosphates were measured to trace movements of sewage sludge and industrial acid wastes. Of the samples collected (January 1969 - April 1970), the average number of copepods per cubic meter ranged from 700 to 41,000 and was within the range reported in other middle Atlantic Coastal waters. Statistical analyses of the samples showed a vertical distribution pattern for the organisms. The displacement volumes of sewage, trace amounts to 9.3 ml/cu, apparently had no short term effects on the number of organisms found; however, most were likely to be killed in acid water of concentrations 1 : 1000 or greater. (Long-Battelle)
W74-06866

THE EFFECTS OF WASTE DISPOSAL IN THE NEW YORK BIGHT. SECTION 5: CHEMICAL STUDIES.
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Sports Fisheries Marine Lab.
Available from the National Technical Information Service as AD-739 535, $1.45 in microfiche. Final Report, February 1972. 185 p, 271 fig, 18 tab, 500 ref.

Descriptors: *Waste disposal, *Zooplankton, *Trace elements, *Water pollution effects, Dissolved oxygen, Salinity, Temperature, Turbidity, Hydrogen ion concentration, Pesticides, Sediments, Oxidation-reduction potential, Nutrients, Water analysis, Primary productivity, Selenium, Zinc, Silver, Rubidium, Cobalt, Sea water, Benthos, Microbiology, Crustaceans, Fish, Water pollution sources, Drifting(Aquatic), Sedimentation, Sewage sludge, Water pollution, Nitrates, Phosphorus, Iron, Measurements, Sampling, Spectrophotometery, On-site tests, Flow, Oil, Phosphates, Copper, Lead, Chromium, Mercury, Chlorophyll, Organic compounds.
Identifiers: Petrochemicals, Biological samples, Environmental samples, Sample preservation, Sample preparation, Dredge spoils, Chlorophyll a, Finfish, *New York Bight, Orthophosphates, Organic phosphorus, Flounder, Muscle, Liver, Scophthalmus aquosus, Pseudopleuronectes americanus, Pseudopleuronectes, Paralichthys oblongus, Paralichthys dentatus, Urophycis, Hormarus americanus, Spisula solidissima, Cyprina, Cancer.

Samples of water, sediments, and organisms were collected from the New York Bight and analyzed to determine the distribution and fate of sewage sludge, dredging spoils, and acid wastes disposed. Samples were collected during 27 cruises from the surface, mod-depth, and bottom in areas with depths of 23 to 27 meters. Water samples were collected with a Van Dorn sampler and divided into subsamples for analysis of iron, chlorophyll a, phosphate, nitrate and DO. Subsamples were stabilized where necessary. Temperature, salinity, turbidity, and pH were also measured. Sediment samples were collected with plastic Phleger coring tubes from the upper 5 cm of a Smith-McIntyre grab, stored in plastic bags, and frozen for later analysis of petrochemicals, copper, lead, chromium, mercury, pesticide metabolites, and determination of redox potential. Populations of benthic organisms and zooplankton were also determined. The methods employed for the analyses are described. From the data, it was concluded that: (1) Acid wastes tend to remain in a distinct pattern after disposal, (2) Sewage sludge results in turbid, phosphorus-rich water containing particulate matter, (3) There was no demonstrable increase in primary productivity as a result of nutrification, (4) Bacteriological activity in sludge depletes the overlying waters of oxygen to levels insufficient to support life, (5) Dredging spoils on bottom sediments contain enough petroleum to harm bottom-dwelling organisms, and (6) The heavy metals, Cu, Pb, Cr, and Hg, originating in sewage and dredging spoils, were found in water, sediments, and animal tissues at toxic levels. (Long-Battelle)
W74-06867

THE EFFECTS OF WASTE DISPOSAL IN THE NEW YORK BIGHT. SECTIONS 7, 8, AND 9.
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Sports Fisheries Marine Lab.
Available from the National Technical Information Service, Sect. 7 as AD-739 537, Sect. 8 as AD-739 538, and Sect. 9 as AD-739 531, $1.45 in microfiche, each. Final Report, February 1972. 128 p, 1 fig, 1 tab, 530 ref.

Descriptors: *Pathology, *Benthos, *Waste disposal, *Water pollution effects, *Bibliographies, Water pollution sources, Benthic fauna, Benthic flora, Zooplankton, Plankton, Aquatic animals, Aquatic life, Microbiology, Crustaceans, Marine fish, Marine animals, Wildlife, Heavy metals, Waste water disposal, Water pollution, Pollutant identification, Distribution patterns.
Identifiers: *New York Bight, Finfish, Characterization, Petrochemicals, Drift organisms.

These are the last three sections of the final report, describing results of studies conducted to obtain data to assess the effects of waste disposal on the marine environment of the New York Bight: Section No. 7, Conclusions; Section No. 8, Literature Cited; Section No. 9, Bibliography. (Long-Battelle)
W74-06868

BIOLOGICAL RESPONSE TO DETERGENT AND NONDETERGENT PHOSPHORUS IN SEWAGE - PART II,
Utah Water Research Lab., Logan.
D. B. Porcella, P. A. Cowan, and E. J. Middlebrooks.
Water and Sewage Works, Vol 120, No 12, p 36-46, December 1973. 3 fig, 7 tab, 11 ref.

Descriptors: *Phosphorus, *Bioassay, *Sewage effluents, *Plant growth, *Toxicity, Biomass, Measurement, Waste dilution, Nutrients, Water pollution effects, Sewage, Sewage treatment, *Growth rates, Suspended solids, Cyanophyta, Chlorophyta, Optical properties, Trace elements, Laboratory tests, Detergents.
Identifiers: *Selenastrum capricornutum, *Anabaena flos-aquae, Dilution, Particulate carbon, Optical density.

The responses are presented of Anabaena flos-aquae and Selenastrum capricornutum to detergent and nondetergent phosphorus. Maximum growth and mean growth rate are discussed with maximum growth being based upon the first and last biomass measurements during the growth cycle (18 or 21 days). Mean growth rate represents growth over a 7-day period. Correlation between particulate carbon (PC), optical density (OD) and suspended solids (SS) was performed to establish the relations between the individual parameters. Dilution studies were made to detect toxicity, indicated by unusual growth as a function of dilution. Deionized and reservoir water were used to dilute effluents from secondary and tertiary sewage treatment. The results indicate the following conclusions: (1) no differences exist between baseline and test samples; (2) response was greater in secondary than tertiary effluents; and (3) iron and trace elements appeared to stimulate slightly greater growth. Samples of various wash products were added to a solution of two percent test secondary effluent in reservoir water. The results showed no significant difference in maximum growth. It can be concluded that the addition of the wash products to treated sewage did not affect the bioassay response. (Holoman-Battelle)
W74-06873

STREAM POLLUTION AND A SIMPLIFIED DIVERSITY INDEX,
Oberlin Coll., Ohio.
For primary bibliographic entry see Field 5A.
W74-06876

EFFECTS OF SOLID WASTE DISPOSAL ON GROUND WATER QUALITY,
For primary bibliographic entry see Field 5B.
W74-06949

PHYTOPLANKTON SUCCESSIONS AND LAKE DYNAMICS IN LAS VEGAS BAY, LAKE MEAD, NEVADA,
Nevada Univ., Reno.
E. R. Koenig, R. W. Tew, and J. E. Deacon.
J Ariz Acad Sci. Vol 7, No 3, p 109-112, 1972.
Identifiers: Bays, Currents, Density, Effluents, Industrial wastes, Lakes, *Nevada(Lake Mead), *Phytoplankton, Seasons, *Sewage effluents, Successions.

Phytoplankton successions, applications of the general growth equation and physical measurements were employed to investigate events occurring at the interface between industrial and sewage effluent contained in Las Vegas Wash and waters of Lake Mead, Nevada. The data indicate that the entering waters tend to form a density current interrupted at intervals by dynamic effects generated in the lake. The dynamic relationships described here for the spring months suggest that a much more thorough understanding of physical, chemical and biological interactions is necessary to permit solution of the numerous problems of Las Vegas Bay.--Copyright 1973, Biological Abstracts, Inc.
W74-07001

EFFECT OF SODIUM-POTASSIUM CHLORIDE MINERAL WATER FROM THE SPLAIS SPRING (DRUSKININKAI HEALTH RESORT) ON THE PSEUDOCHOLINESTERASE ACTIVITY OF BLOOD SERUM AND PROTEIN-SYNTHESIZING FUNCTION OF THE LIVER IN EXPERIMENTAL ACUTE TOXIC HEPATITIS, (IN RUSSIAN),
K. A. Ambrashka.
Vopr Kurortol Fizioter Lech Fiz Kul't. Vol 37, No 2, p 154-160, 1972. Illus.
Identifiers: Acute toxicity, Blood serum, Chlorides, Cholin, *Health resorts, *Hepatitis, Liver, *Minerals, Potassium, Protein, Rats, Sodium, Springs, Water pollution effects, *USSR(Spalis spring), Salts.

The ingestion of water (containing NaCl, KCl and some SO42- and Mg2+) from the Spalis spring (USSR) shows therapeutic effects for acute toxic hepatitis in white rats. This is expressed by a more complete recovery of the impaired liver, and trend towards normalization of the pseudocholinesterase activity of the blood serum and the main indices of the protein-synthesizing func-

tion of the liver.--Copyright 1973, Biological Abstracts, Inc.
W74-07005

QUALITATIVE REQUIREMENTS OF YOUNG EELS ANGUILLA JAPONICA FOR WATER-SOLUBLE VITAMINS AND THEIR DEFICIENCY SYMPTOMS,
Freshwater Fisheries Research Lab., Tokyo (Japan).
S. Arai, T. Nose, and Y. Hashimoto.
Bull Freshwater Fish Res Lab. Vol 22, No 1, p 69-83, 1972. Illus.
Identifiers: Anguilla-japonica, *Deficiency symptoms, *Eels, Qualitative requirements, *Vitamins(Water soluble).

Using a purified test diet developed for eels, qualitative requirements of eels for water-soluble vitamins were investigated. Eels require 11 vitamins, thiamine, riboflavin, pyridoxine, pantothenic acid, folic acid, biotin, choline, nicotinic acid, inositol, vitamin B12 and ascorbic acid for normal growth, but not p-aminobenzoic acid. The deficiency syndromes are described.--Copyright 1973, Biological Abstracts, Inc.
W74-07006

RADIOECOLOGICAL RESEARCHES IN FRESHWATER AND TERRESTRIAL ENVIRONMENT, (IN ITALIAN),
For primary bibliographic entry see Field 5B.
W74-07009

SYSTEMS ANALYSIS IN THE MARION LAKE IBP PROJECT,
British Columbia Univ., Vancouver.
C. J. Walters, and I. E. Efford.
Oecologia (Berl). Vol 11, No 1, p 33-44, 1972.
Identifiers: Biological studies, *Canada(Marion Lake-B.C.), Consumer, Density, Growth, Lakes, *Primary production, Season, *Systems analysis, IBP projects, Model studies, *Simulation analysis.

Modeling work in the Marion Lake Project (British Columbia, Canada) has led to a number of simulation models that trace the fate of primary production through consumer components of the lake ecosystem. Two of these models illustrate extremes in realism and generality: a simple compartment-flow system, and a detailed population model that represents density and individual growth of 24 major animal species. Both models are adequate to describe normal seasonal changes in the variables that they represent, but the simple model may give better predictions about response of the system to disturbance. Modeling efforts would have been much more successful if they had been initiated at the start of the project rather than after much field data were already collected.--Copyright 1973, Biological Abstracts, Inc.
W74-07010

DISTRIBUTION AND SEASONAL VARIATIONS OF THE PLANKTON IN 'RIVIERE DE MORLAIX,' (IN FRENCH),
G. Le Fevre-Lehoerff.
C R Hebd Seances Acad Sci Ser D Sci Nat. Vol 275, No 15, p 1681-1684, 1972. Illus.
Identifiers: Appendicularia, Brachyura, Chaetognatha, Cladocera, Copepoda, *Distribution, *France(Riviere de Morlaix), Mysidacea, *Plankton, Polychaeta, *Seasonal, Teleost, *Estuary, Tidal estuaries.

The 'Riviere de Morlaix,' a tidal estuary, is on the northern coast of Brittany (France). Monthly collected samples obtained during neap low tide at 9 points made it possible to determine the major zooplanktonic groups represented in the estuary, the homogeneity or heterogeneity of distribution of the main species, and the amplitude of their seasonal variations. The most representative groups involve the holoplanktonic Crustacea, Copepoda (Acartiidae, Centropagidae), Cladocera, Mysidacea, as well as the Appendicularia and the Chaetognatha. As for the meroplankton, it is represented by larvae of Polychaeta and Brachyura, and eggs and larva of Teleostei. A description is given of the zones, nature of the bottom, temperature, salinity, and trophic relations.--Copyright, 1973, Biological Abstracts, Inc.
W74-07012

CORRELATION BETWEEN CO2 AND O2 CONCENTRATIONS IN LAKE ERIE, USA,
State Univ. Coll., Fredonia, N.Y.
K. G. Wood, and J. Verduin.
Arch Hydrobiol. Vol 71, No 1, p 1-16. 1972. Illus.
Identifiers: *Anaerobic conditions, *Carbon dioxide, Lakes, *Oxygen, Respiration, *Lake Erie, Hypolimnion.

Oxygen (O2) concentration was correlated with total carbon dioxide (CO2) concentration, both variables reported as the micro moles/l difference from air equilibrium. CO2 deficits were not associated with corresponding O2 supersaturation, but O2 deficits were associated with corresponding O2 excess, mole for mole. However the hypolimnion of the central basin of Lake Erie showed as much as 30% greater CO2 excess than O2 deficit during late Aug. when dissolved O2 values approached zero. These values suggest a significant anaerobic respiration contribution. New equations are provided for studies of carbonate equilibria. The differential titration method for estimation of biological productivity is discussed.--Copyright 1973, Biological Abstracts, Inc.
W74-07025

BALANTIDIASIS OUTBREAK IN TRUK,
P. D. Walzer, F. N. Judson, K. B. Murphy, G. R. Healy, and D. K. English.
Am J Trop Med Hyg. Vol 22, No 1, p 33-41. 1973. Illus.
Identifiers: *Balantidiasis, *Caroline Islands(Truk), *Epidemics(Human), Islands, Typhoons, *Animal wastes(Pigs), Water pollution effects.

In May and June 1971, an epidemic of balantidiasis involving 110 persons occurred on Truk, Caroline Islands following a devastating typhoon on 1 May. The disease was mild, self-limited, and lacked distinguishing clinical features. The outbreak was multifocal in origin, occurred in all age groups and with equal sex distribution, and terminated spontaneously by early July. The people of Truk live on close association with pigs, and the epidemic probably resulted from widespread contamination by pig feces of ground and surface water supplies, which the people were forced to use after their catchment systems were destroyed by the typhoon.--Copyright 1973, Biological Abstracts, Inc.
W74-07031

GROWTH COMPARISONS OF OYSTERS, MUSSELS AND SCALLOPS CULTIVATED ON ALGAE GROWTH WITH ARTIFICIAL MEDIUM AND TREATED SEWAGE EFFLUENT,
Woods Hole Oceanographic Institution, Mass. Dept. of Biology.
K. R. Tenore, and W. M. Dunstan.
Chesapeake Sci. Vol 14, No 1, p 64-66. 1973.
Identifiers: Aequipecten-irradians, *Algae, Crassostrea-virginica, Effluent, Medium, Mortality, *Mussels, Mytilus-edulis, *Oysters, *Scallops, *Sewage, Shell growth, Dry-meat weight, *Growth comparisons.

Shell growth, dry-meat weight, and mortality of the American oyster (Crassostrea virginica), the blue mussel (Mytilus edulis) and the bay scallop (Aequipecten irradians) cultured for 3 mo. on algae grown on artificail medium and in secondary-treated sewage effluent exhibited no significant differences.--Copyright 1973, Biological Abstracts, Inc.
W74-07035

AN EPIDEMIOLOGICAL STUDY ON CLONORCHIASIS IN KYOTO CITY, (IN JAPANESE),
Kyoto Prefectural Univ. of Medicine (Japan). Dept. of Medical Zoology.
M. Nagahana, K. Matsuno, M. Iwaki, K. Oda, and A. Yamaguchi.
Jap J Parasitol. Vol 21, No 3, p 143-149. 1972. English summary.
Identifiers: *Clonorchiasis, Clonorchis-Sinensis, Dogs, *Epidemiology, Fish, Human diseases, *Japan(Kyoto City), Parafossarulus-Manchouricus, Rats, Waterways, *Cities, Water pollution effects.

Two waterways flow through Kyoto prefecture from Lake Biwa in Shiga prefecture, 1 of the epidemic areas of clonorchiasis in Japan. One is the River Uji, and the other is the Kyoto drainage canal flowing through Kyoto City. The present study was conducted from 1968-1969. The construction work of this canal was finished in 1912 before Muto found and determined the first intermediate host, Parafossarulus manchouricus at the lake side of Biwa in 1918. Although Kawamura and Hirase had already described the finding of the snail in this canal before 1919 (Muto, 1918), there was no systematic survey of clonorchiasis in and/or around this canal. Even today, this canal is utilized for electrification and water service for Kyoto citizens. This canal also is utilized for fishing during all seasons and for swimming in summer. In a survey along the whole canal (about 24 km), the snail was found at 6 stations. An examination on the metaceriae of C. sinensis in fishes caught in the canal where the snail was found, showed many fishes positive for the metacercariae. In the case of P. parva, 13 of 18 fishes (72.2%) were positive for the metacercariae of C. sinensis. Examinations for C. sinensis in final hosts (dogs and house rats) were performed at an area near the canal. Two of 38 dogs (5.3%) were positive for C. sinensis eggs, and 4 of 30 house rats (13.3%) were infected with adult worms of C. sinensis. Kyoto city includes an epidemic areas of clonorchiasis although not on a large scale.--Copyright 1973, Biological Abstracts, Inc.
W74-07050

5D. Waste Treatment Processes

INTERMITTENT SAND FILTRATION TO UPGRADE EXISTING WASTEWATER TREATMENT FACILITIES,
Utah Center for Water Resources Research, Logan.
G. R. Marshall, and E. J. Middlebrooks.
Available from the National Technical Information Service as PB-231 205; $7.25 in paper copy, $1.45 in microfiche. Utah Water Research Publication PRJEW115-2. February 1974. 80 p, 26 fig, 34 tab, 40 ref. OWRR A-015-UTAH(1). 14-01-0001-3845.

Descriptors: *Filtration, *Waste water treatment, *Oxidation lagoons, *Tertiary treatment, Water quality standards, Algae, Pilot plant, Temperature, Treatment facilities, Effluents.
Identifiers: Intermittent sand filters, Slow sand filters, *Algae removal, Effluent polishing, *Sand filters.

Laboratory and field scale intermittent sand filtration of wastewater lagoon effluents was found to be a promising and economically feasible means of upgrading wastewater effluents to meet more stringent water quality standards of today. While the process was found to be very efficient at oxidizing applied nitrogen compounds, it was also found to be inefficient at removing applied phosphorus compounds. The process was found to

be capable of removing appreciable amounts of applied algae, still some algae were found to pass the entire filter depth. When operating under applied BOD concentrations typical in a properly operated secondary biological treatment plant effluent, the process was found to consistently meet present Utah Class 'C' water quality standards for BOD (equal to or less than 5 mg/1). Very high total coliform removal efficiency was exhibited by the process of intermittent sand filtration. The number of consecutive days of operation before cleaning was required was found to be related to the hydraulic loading rate and the filter influent suspended solids concentration. It was estimated that an effluent polishing intermittent sand filter process can be constructed and operated at a cost ranging from $15 to $47 per million gallons of filtrate.
W74-06506

UTILIZATION OF TRICKLING FILTERS FOR DUAL TREATMENT OF DRY AND WET WEATHER FLOWS,
Killam (Elson T.) Associates, Inc., Milburn, N. J.
P. Homack, K. Zippler, and E. Herkert.
Copy Available from GPO Sup Doc as EP1.23:670/2-73-071, $1.50; microfiche from NTIS as PB-231 251, $1.45. Environmental Protection Agency, Technology Series, Report EPA-670/2-73-071, September 1973. 118 p, 28 fig, 39 tab. EPA Project 11020 FAN.

Descriptors: *Trickling filters, *Filtration, *Waste water treatment, Rocks, Infiltration, Control, Treatment, Dual purpose, Dry seasons, Wet seasons, *New Jersey, *Sewage treatment.
Identifiers: *Dual treatment, New Providence(NJ).

A trickling filter sewage treatment plant was designed and constructed in the Borough of New Providence, New Jersey to alleviate local sewage treatment plant hydraulic overloading and resultant loss of treatment efficiency caused by excessive infiltration. The Plant utilizes two high rate trickling filters, one with rock media, the other with plastic media, operating in parallel to treat wet weather flow. During dry weather periods the plant is operated in series with a controlled flow to maintain an active biological slime on the filters. The plant also consists of a primary clarifier-leveling reservoir, secondary clarifier and chlorine contact tank. No sludge handling facilities are provided. A study of plant efficiency for one year indicated that during dry weather controlled flow operation, the BOD and suspended solids removal efficiency varied from 85 to 90 per cent. When operated during wet weather, the BOD and suspended solids removal efficiency varied from 56 to 74 percent. The plastic media trickling filter was found to remove more BOD per unit volume than the rock media trickling filter, under both dry and wet weather flow conditions. This investigation has shown that it is both technically feasible and economical to design, construct and operate a treatment plant to process both the controlled dry weather and the higher flows encountered during periods of excessive infiltration using a combination of series-parallel high rate trickling filters. (EPA)
W74-06508

PHYSICAL-CHEMICAL TREATMENT OF RAW MUNICIPAL WASTEWATER,
District of Columbia Dept. of Environmental Services, Washington.
D. F. Bishop, T. P. O'Farrell, A. F. Cassel, and A. P. Pinto.
Copy Available from GPO Sup Doc as EP1.23:670/2-73-070, $1.05; microfiche from NTIS as PB-231 250, $1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-070, September 1973. 60 p, 13 fig, 16 tab, 30 ref. EPA Project 11010 EYM. 14-12-818.

Descriptors: *Waste water treatment, Anaerobic conditions, *Filtration, *Adsorption, *Ion exchange, *District of Columbia, Biochemical oxygen demand, Calcium carbonate, Chemical oxygen demand, Colloids, Ammonia organic loading, *Flocculation, Phosphorus, Nitrogen, Lime, Sedimentation.
Identifiers: *Physical-chemical treatment, Lime clarification, *Municipal wastewater, Carbon adsorption, Breakpoint chlorination, Recarbonation.

Physical-chemical treatment of raw wastewater consisted of two-stage lime clarification with intermediate recarbonation, filtration, pH control, ion exchange or breakpoint chlorination, and adsorption. Lime treatment with approximately 300 mg/l of CaO increased the wastewater pH to 11.5 and removed 96% of the phosphorus and 80% of the organics. In the second stage, recarbonation with 120 mg/l of CO2 and mineral addition of 5 mg/l of Fe+++ reduced the pH to 10.0 and precipitaed excess Ca++ as CaCO3. Dual media filtration decreased effluent suspended solids and total phosphorus to less than 5 mg/l and 0.15 mg/l as P, respectively. Addition of 10 mg/l chlorine to the filter influent controlled biological growth within the filter and produced filter runs of greater than 50 hours. With extensive operator surveillance, the clinoptilolite exchange media reduced the NH3 to less than 1 mg/l as NH+4-N. Breakpoint chlorination oxidized the NH3 to N2, leaving a residual NH3-N concentration of less than 0.4 mg/l. The 20 mg/l of soluble BOD entering the granular carbon columns prodiced anaerobic biological growth on the carbon, which contributed to heavy H2S production and high carbon losses during backwash. Breakpoint chlorination ahead of carbon adsorption minimized biological activity. The complete physical-chemical system, with ion exchange, removed 98% of the phosphorus, 95% of the organics (COD) and 78% of the total nitrogen. With breakpoint chlorination, the complete system removed 98% of the phosphorus, 94% of the organics (COD) and 86% of the total nitrogen. (Kisenbauer-EPA)
W74-06509

TECHNICAL AND ECONOMIC EVALUATION OF COOLING SYSTEM BLOWDOWN CONTROL TECHNIQUES,
Wapora, Inc., Washington, D.C.
D. B. Boies, J. E. Levin, and D. Baratz.
Copy available from GPO Sup Doc as EP1.23:660/2-73-026, $1.20; microfiche from NTIS as PB-231 258, $1.45. Environmental Protection Agency, Technology Series Report EPA-660/2-73-026, November 1973. 73 p, 13 fig, 11 tab. PE B12036, ROAP 16ACQ Task 11. 68-03-0233.

Descriptors: *Cooling towers, Cooling water, *Control systems, *Waste water treatment, Automatic control, Instrumentation, Management, Water pollution treatment, Treatment facilities, Recycling.
Identifiers: *Cooling system blowdown.

Methods are described which are either currently applied or commercially available to reduce the pollution impact of blowdown from large cooling systems (recirculating rates greater than 500 cfs). Treatment equipment descriptions, capabilities and compatibilities are discussed. Where appropriate, broad ranges of both capital costs and operating expenses are provided. The described methods include (a) the application and design of closed-cycle cooling systems, (b) makeup water treatment, (c) recirculating water treatment, (d) mechanical treatment, and (e) blowdown treatment and/or disposal. (EPA)
W74-06510

PACKINGHOUSE WASTE TREATMENT.
Stockton Dept. of Public Works, Calif.
Available from the National Technical Information Service as PB-231 976; $15.25 in paper copy, $1.45 in microfiche. Environmental Protection Agency Report, (April 1970). 238 p, 34 fig, 45 tab. EPA Project 11060 DRT.

Descriptors: *Aeration, *Activated sludge, *Food processing industry, *Waste water treatment, Biological treatment, Corrosion control, Sampling, Sewage, Sewers.
Identifiers: *Meat packing wastewater, U-Tube aeration, *In-Sewer treatment, Sewer gases, Pretreatment.

The feasibility to demonstrate pretreatment of packinghouse wastewaters was investigated in the laboratory. The pretreatment consisted of a Kehr activated sludge process in conjunction with in-sewer treatment. Laboratory tests were designed to study the oxygen uptake, contact time, potential foaming and scum problems, flow characteristics, odors, BOD removal efficiency, clarification, and return of activated sludge of high suspended solids mixed liquor reactors using packinghouse wastes. Sampling and analysis of the sewer flow and gases generated, along with work on in-sewer treatment and corrosion protection evaluated as part of the pretreatment process. Main water quality control plant description and operations were given along with the results of an extensive sewage sampling program. An economic analysis was made of the different pretreatment processes and of central treatment. Pretreatment of the waste was shown to be economically desirable. (Scaief-EPA)
W74-06511

AN APPRAISAL OF NEUTRALIZATION PROCESSES TO TREAT COAL MINE DRAINAGE,
Pennsylvania State Univ., University Park. Coll. of Earth and Mineral Sciences.
H. L. Lovell.
Copy available from GPO Sup Doc as EP1.23:670/2-73-093, $3.50; microfiche from NTIS as PB-231 249, $1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-093, November 1973. 347 p, 65 fig, 66 tab, 100 ref. Partly sponsored by Pennsylvania Dept. of Environmental Resources. EPA Project 14010 EFN.

Descriptors: *Coal mine acids, *Neutralization, *Waste water treatment, Operation and maintenance, *Sludge, Treatment facilities, *Separation techniques, Bacteria, Dewatering, Disposal, Capital costs, Operating costs, *Oxidation, Water quality, *Pennsylvania.
Identifiers: Treatment processes, Autotrophic bacteria, Alkaline reagents, Hollywood(Penn).

Four different quality drainages were treated and detailed results tabulated. Appropriate unit operations, from water collection to sludge disposal were considered for eight different reagents (calcium/magnesium carbonate, oxide and hydroxide; caustic soda and soda ash). Necessary process variations were possible with a versatile 500,000 gpd facility. Limestone has the least cost per neutralization equivalent and may be used with drainage containing up to 500 mg/l iron II. The resulting sludge is dense, rapid settling and dewaterable. Lime can treat any drainage efficiently but may result in excess consumption. Lime-produced sludges are voluminous and difficult to handle. Unitized sludge recycle process, using lime, forms a dense, dewaterable sludge. Iron II oxidation was accomplished by air in alkaline systems or with autotrophic bacteria in acid system. Thickeners are preferred to settling lagoons to separate sludge in larger plants. Dewatered sludge requires least disposal volume. Drying basin dewatering is pragmatic, but filtration or centrifugation are effective, but more costly. Settled sludge may be discarded directly to abandoned deep or surface mines; while dewatered sludge may be placed in landfill areas. (EPA)
W74-06512

TREATMENT OF DOMESTIC WASTEWATER AND NSSC PULP AND PAPER MILL WASTES,
Harriman Utility Board, Tenn.
P. J. Farrell, L. R. Heble, and A. G. Steuhser.
Copy available from GPO Sup Doc as EP1.23:660/2-73-010 $1.40; microfiche from NTIS as PB-231 267, $1.45. Environmental Protection Agency, Technology Series Report EPA-660/2-73-010, December 1973. 104 p, 32 fig, 21 tab, 7 ref. EPA Project 12130 DBF.

Descriptors: *Domestic wastes, *Waste water treatment, Sulfites, *Pulp wastes, *Aeration, Disinfection, *Filtration, Color, Organic wastes, Solid wastes, Biochemical oxygen demand.
Identifiers: *Joint treatment, Organics removal, Color removal, Primary clarification, Extended aeration, Final clarification, Biofiltration.

The Harriman Utility Board and the Mead Corporation made a study of the joint treatment of primary clarified domestic waste and neutral sulfite semichemical (NSSC) pulp and paper mill wastes. A pilot plant was constructed and operated from April, 1971 through March, 1972. The most effective treatment scheme consisted of a biofilter (used as a roughing filter) and an extended aeration. Color reduction was accomplished by massive lime and chlorine additions due to the color's dependency on pH. Disinfection was optimum when ammonia was mixed with the combined wastes prior to chlorination. The biofilter's BOD removal efficiency ranged from 3 to 45 percent. Extended aeration's BOD removal efficiency ranged from 24 to 98 percent. (EPA)
W74-06513

RECOVERY OF FATTY MATERIALS FROM EDIBLE OIL REFINERY EFFLUENTS,
Swift and Co., Oak Brook, Ill. Research and Development Center.
W. C. Seng.
Copy available from GPO Sup Doc as EP1.23:660/2-73-015, $1.60; microfiche from NTIS as PB-231 268, $1.45. Environmental Protection Agency, Technology Series Report EPA-660/2-73-015, December 1973. 148 p, 27 fig, 27 tab, 4 ref. EPA Project 12060 DQV.

Descriptors: Treatment facilities, *Industrial wastes, *Waste water treatment, *Oil wastes, Polymers, *Flocculation, *Centrifugation, Market value, *Byproducts, Cathodic protection, Water pollution sources, Coagulation, Rectifiers, Biological oxygen demand, Suspended solids, Anodes, Anions, Cathodes, Cations, Water pollution, Turbidity, Zeta potential, Flotation, *Operating costs, Laboratory tests, Instrumentation, Corrosion control, *Illinois.
Identifiers: *Fatty wastes, Electro-coagulation, pH control, Hexane solubles, Edible fats, Edible oils, Bradley(Ill).

New full scale equipment was added to existing standard waste treatment equipment at the Swift and Company Edible Oil Refinery at Bradley, Illinois. Synthetic acrylamide polymer flocculants with alum, and impressed current, were evaluated for removal of fatty materials from the plant waste water. An in-plant waste water survey was made. A DeLaval PX-213 bowl opening, disc stack centrifuge was successfully tested to concentrate the removed fatty material after caustic and sulfuric acid treatment. The 7000 pounds daily of recovered oil (98% ether soluble), worth 4-1/4 to 4-5/8 cents per pound, could offset 60% of the total waste treatment direct operating costs. (EPA)
W74-06514

A DESIGN AND ECONOMIC EVALUATION OF CATALYTIC OXIDATION OF PHENOLS IN WASTEWATER,
Delaware Univ., Newark.
H. H. Ficke.
Available from the National Technical Information Service as PB-231 220; $7.75 in paper copy, $1.45 in microfiche. Delaware Water Resources Center, Newark Research Report, May 1973. 76 p, 5 fig, 5 tab, 31 ref, 5 append. OWRR A-14-DEL (4).

Descriptors: *Waste water treatment, *Phenols, *Oxidation, Catalysts, Chemical reactions, Design, Evaluation, *Cost analysis.
Identifiers: *Catalytic oxidation.

Catalytic oxidation is a possible process for treating wastewater effluents containing phenol from catalytic cracking units and coal tar plants. Experimental data were collected to determine intrinsic rate constants for phenol oxidation to CO2 and water. These constants were used in the design and optimization of a proposed process. Total cost for 99% reduction of phenol from 1000 gallons of wastewater (700 ppm) from the catalytic cracker was $0.35. Total cost per 1000 gallons (4000 ppm) from coal tar was $0.60. (Knapp-USGS)
W74-06516

DEMONSTRATION OF A NON-AQUEOUS SEWAGE DISPOSAL SYSTEM,
Black Hills Conservancy Sub-District, Rapid City, S.Dak.
F. L. Matthew, and E. E. Nesheim.
Copy available from GPO Sup Doc as EP1.23:670/2-73-088, $1.60; microfiche from NTIS as PB-231 338, $1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-088, December 1973. 131 p, 7 fig, 20 tab, 2 ref. EPA Project 15010 PBK.

Descriptors: *Waste water treatment, *Water reuse, Water pollution control, Operating costs, *Recreation facilities, *Sewage treatment, *South Dakota.
Identifiers: *Chemical treatment, Recirculating systems, Watercraft wastes, *Mount Rushmore(So. Dak).

A prototype non-aqueous wastewater treatment system utilizing recirculated mineral oil as a collection and transport media was installed and operated at the Mount Rushmore National Memorial, Rapid City, South Dakota. The project was conducted to demonstrate the feasibility and effectiveness of the non-aqueous system for application at recreational and similarly remote areas. The non-aqueous system was evaluated for six months during the 1972 visitation season. During this period, data were collected to determine system usage rate and user waste loading and for the evaluation of the physical, biological, and chemical content of the flush oil as a function of system usage. System operation and reliability were also demonstrated during the test period. The demonstration showed that the non-aqueous treatment system is effective in the collection, transport, and disposal of human waste. Odors in the oil flush media and from the treatment system presented an aesthetic problem which makes the use of this system undesirable for recreational areas such as Rushmore. System redesign to prevent organic accumulations and the routine use of an oxidizer-bactericide to eliminate odor-producing bacterial activity is required before this concept can be suitable for high-use visible recreational areas. Water conservation is achieved when recirculated mineral oil is used to collect and transport human wastes. The waste volume is reduced by 98 percent in comparison with conventional water carriage systems. (EPA)
W74-06519

COLIFORM BACTERIA GROWTH AND CONTROL IN AERATED STABILIZATION BASINS,
Crown Zellerbach Corp., Camas, Wash. Environmental Services Div.
S. H. Watkins.
Copy available from GPO Sup Doc as EP1.23:660/2-73-028 for $2.75; microfiche from NTIS as PB-231 259 for $1.45. Environmental Protection Agency, Technology Series EPA-660/2-73-028, December 1973. 280 p, 47 fig, 75 tab, 15 ref. EPA Project 12040 GQD.

Descriptors: *Tertiary treatment, *Waste water treatment, *Coliforms, *Pulp wastes, *Disinfection, *Toxicity, *Chlorination, Bioassay, Chemical analysis, Microorganisms, Biochemical oxygen demand, Sulfite liquors, Salmonids, *Oregon, Water quality standards.
Identifiers: Ammonia base, Chloramines, Prosthecate bacteria, Sanitary survey, South Santiam River(Ore), Lebanon(Ore).

Secondary effluent from an ammonia base sulfite mill in Lebanon, Oregon, increased concentrations of coliforms (total coliform bacteria) in receiving waters to more than 1000 per 100 ml, the State standard. Factors responsible for high coliform populations were determined and a disinfection method was developed for reducing their numbers in secondary effluent. Chlorination was often ineffective. However, by injecting NaOH into the chlorinator's water supply, adequate coliform kill was achieved with approximately 5.7 ppm chlorine and 3.3 ppm NaOH. Continuous chlorination affected a reduction in coliforms in receiving waters to acceptable levels and the chlorinated effluent had a low degree of toxicity to salmonid fingerlings. (EPA)
W74-06520

COLOR REMOVAL FROM KRAFT MILL EFFLUENTS BY ULTRAFILTRATION,
Champion International Corp., Hamilton, Ohio.
H. A. Fremont, D. C. Tate, and R. L. Goldsmith.
Copy available from GPO Sup Doc as EP1.23:660/2-73-019, $2.40; microfiche from NTIS as PB $1.45. Environmental Protection Agency, Technology Series Report EPA-660/2-73-019, December 1973. 240 p, 58 fig, 35 tab. EPA Project S 800-261.

Descriptors: Pulp and Paper industry, Effluents, *Waste water treatment, Pilot plants, Cost analysis, *Pulp wastes, *Filtration, Membrane processes, Organic wastes, Reverse osmosis, Color, Operation and maintenance, Incineration, *Water reuse, *North Carolina, Recycling.
Identifiers: *Ultrafiltration Process, Waste water recycle, *Color removal, Organic removal, Bleach caustic extraction effluent, Kraft Decker effluent, Canton(N.C.).

The purpose was to examine ultrafiltration as a means of reducing color in kraft mill effluents more efficiently and/or more economically than the presently available method. The program included the six month operation of a 10,000 gpd pilot plant at the Champion Papers' Canton, North Carolina, pulp and paper mill. The major experimental effort dealt with treatment of pine bleaching caustic extraction filtrate with lesser emphasis on unbleached pine and hardwood pulp washing Decker effluents. Four experimental aspects of the process were evaluated: feed pretreatment, ultrafiltration, concentrate disposal and water reuse potential. The process color removal efficiency was satisfactory. For all influent studied typical results were 90% color removal with 98.5-99% water recovery. The total operating costs, including amortization and exclusive of credits for a one million gallon per day treatment plant are estimated to be $0.58/tons bleached pulp for pine caustic extraction filtrate influent and $0.33/ton total pulp for Decker effluents as influent. (EPA)
W74-06521

INVESTIGATION OF TREATING ELECTROPLATERS CYANIDE WASTE BY ELECTRODIALYSIS,
RAI Research Corp., Long Island City, N.Y.
S. B. Tuwiner.
Copy available from GPO Sup Doc as EP1.23/2:73-287, $0.90; microfiche from NTIS as PB-231263 $1.45. Environmental Protection Agen-

cy Technology Series Report EPA-R2-73-287, December 1973. 48 p, 2 fig, 2 tab, 21 ref. EPA Project 12010 DFS.

Descriptors: Effluents, Industrial wastes, Membrane processes, *Dialysis, Separation techniques, Liquid wastes, *Electro-osmosis, Ion transport, *Waste water treatment.
Identifiers: *Cyanide, *Electroplating, *Electrodialysis.

An electrodialysis procedure is developed whereby the discharge of rinsewater is eliminated. The work, according to this method, is rinsed in a sequence of two rinses; the final rinse contains a concentration of cyanide of 1/10,000 of that of the plating. These concentrations are maintained by the use of electrodialysis to transport cyanides continuously from the second rinse solution back to the first rinse solution and also from the first rinse back to the plating bath. In this way, all cyanide is recovered and returned to the bath. Design parameters are determined from the experiments and costs are estimated. The experimental system used was a prototype of a commercial size electrodialysis unit operated continuously under conditions which simulated those of the projected two-stage commercial system using a cyanide copper plating bath. (EPA)
W74-06522

TERTIARY TREATMENT WITH A CONTROLLED ECOLOGICAL SYSTEM.
Las Virgenes Municipal Water District, Calabasas, Calif.
Copy available from GPO Sup Doc as EP1.23:660/2-73-022 $0.90; microfiche from NTIS as PB-231261 $1.45. Environmental Protection Agency Technology Series Report EPA-660/2-73-022, December 1973. 43 p, 21 fig, 6 tab, 3 ref. EPA Project 16080 FBH.

Descriptors: *Waste water treatment, Water reclamation, Aquatic biology, *Tertiary treatment, Oxidation lagoons, Zooplankton, Ecosystems, *Daphnia, *Algae, Water pollution control.
Identifiers: Biological processes, Polishing(Treatment).

A two-stage pond system was operated as a process for polishing secondary sewage effluent. The shallow first stage was an oxidation pond in which a heavy growth of algae was permitted to develope. In the second stage a population of Daphnia pulex consumed the algae. Detention times were about 10 days in each stage. Chemical and biological monitoring were carried out over a year's period to determine feasibility of using the process to produce recreational-grade water and reduce algae growth potential. While the Daphnia remained as the dominant zooplankton species in the second pond throughout the observation period, their concentration varied between 100 and 1,500 organisms/liter. Excellent water clarity was obtained when the Daphnia were above 500 organisms/liter, and at such times the over-all COD reduction was greater than 40 percent. Significant removal of nutrients occurred only during the months of July and August, when N and P reductions were 48 percent and 63 percent respectively. Performance was hampered by occasional invasions of Dephnia or rotifers in the first-stage pond, which decimated the algae. Such events were not successfully controlled and remain the principal obstacle to further process development. (EPA)
W74-06524

HYPOLIMNION AERATION WITH COMMERCIAL OXYGEN - VOL. I - DYNAMICS OF BUBBLE PLUME,
Texas Univ., Austin.
R. E. Speece, F. Rayyan, and G. Murfee.
Copy available from GPO Sup Doc as EP1.23:660/2-73-025a, $2.00; microfiche from NTIS as PB $1.45. Environmental Protection Agency, Technology Series Report EPA-660/2-73-025a, December 1973. 184 p, 86 fig, 7 tab, 47 ref. EPA Project 16080 FYW.

Descriptors: Water quality, *Hypolimnion, *Aeration, Stratification, Water quality control, *Texas, *Oxygenation, *Bubbles, Model studies, Dissolved oxygen, Absorption.
Identifiers: *Lake Travis(Tex.), Bubble plumes.

This study deals with a proposed scheme for restoration and maintenance of dissolved oxygen in the hypolimnion of stratified impoundments without disturbing the stratification. Commercial oxygen is an economical alternative to air as an oxygen source for hypolimnion aeration. In addition, it possesses many other advantages, the main one being avoidance of nitrogen gas supersaturation and its related toxicity to fish. Laboratory and lake studies were conducted to demonstrate the gas transfer dynamics of a bubble plume generated by the injection of pure oxygen bubbles within the hypolimnion. The experimental results verified the practicality of the original concept-hypolimnion aeration which preserves stratification. Efficient oxygen absorption was achieved within the hypolimnion. Mathematical models were formulated and calibrated by experimental data. The calibrated model was then used to predict the oxygen transfer and hydrodynamic characteristics of the bubble plume for various oxygen injection rates and injection depths. The sensitivity of the model to the various input parameters was shown. (See also W74-66526) (EPA)
W74-06525

HYPOLIMNION AERATION WITH COMMERCIAL OXYGEN - VOL. II - BUBBLE PLUME GAS TRANSFER,
Texas Univ., Austin.
R. E. Speece, F. Rayyan, and G. Murfee.
Copy available from GPO Sup Doc as EP1.23:660/2-73-025b $1.80; microfiche from NTIS as PB $1.45. Environmental Protection Agency Technology Series Report EPA-660/2-73-025b, December 1973. 150 p, 77 fig, 2 tab, 14 ref. EPA Project 16080 FYW.

Descriptors: Water quality, *Hypolimnion, *Aeration, Stratification, Water quality control, *Texas, Model studies, *Bubbles, Dissolved oxygen, *Oxygenation, Absorption.
Identifiers: *Lake Travis(Tex.), *Gas transfer.

This study deals with a proposed scheme for restoration and maintenance of dissolved oxygen in the hypolmnion of stratified impoundments without disturbing the stratification. Commercial oxygen is an economical alternative to air as an oxygen source for hypolimnion aeration. In addition, it possesses many other advantages, the main one being avoidance of nitrogen gas supersaturation and its related toxicity to fish. Laboratory and lake studies were conducted to demonstrate the gas transfer dynamics of a bubble plume generated by the injection of pure oxygen bubbles within the hypolimnion. The experimental results verified the practicality of the original concept-hypolimnion aeration which preserves stratification. Efficient oxygen absorption was achieved within the hypolimnion. Mathematical models were formulated and calibrated by experimental data. The calibrated model was then used to predict the oxygen transfer and hydrodynamic characteristics of the bubble plume for various oxygen injection rates and injection depths. The sensitivity of the model to the various input parameters was shown. (See also W74-06525) (EPA)
W74-06526

INFORMATION RESOURCE: FINAL REPORT WATER POLLUTION CONTROL IN WATER UTILITIES,
American Water Works Association Research Foundation, New York.
For primary bibliographic entry see Field 5F.
W74-06527

A STUDY OF HAZARDOUS WASTE MATERIALS, HAZARDOUS EFFECTS AND DISPOSAL METHODS. VOLUME I.
Booz-Allen Applied Research, Inc., Bethesda, Md.
For primary bibliographic entry see Field 5C.
W74-06555

A STUDY OF HAZARDOUS WASTE MATERIALS, HAZARDOUS EFFECTS AND DISPOSAL METHODS. VOLUME II.
Booz-Allen Applied Research, Inc., Bethesda, Md.
For primary bibliographic entry see Field 5C.
W74-06556

A STUDY OF HAZARDOUS WASTE MATERIALS, HAZARDOUS EFFECTS AND DISPOSAL METHODS. VOLUME III.
Booz-Allen Applied Research, Inc., Bethesda, Md.
For primary bibliographic entry see Field 5C.
W74-06557

FRESHWATER BIOLOGY AND POLLUTION ECOLOGY: TRAINING MANUAL.
Environmental Protection Agency, Cincinnati, Ohio. Office of Water Program Operations.
For primary bibliographic entry see Field 5A.
W74-06558

EMERGENCY PLANNING FOR MUNICIPAL WASTEWATER TREATMENT FACILITIES,
Wiley and Wilson, Inc., Lynchburg, Va.
R. A. Lemon, R. L. Green, and G. L. Page, Jr.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402. Price $1.25. Environmental Protection Agency, Washington, D.C. Office of Water Program Operations, Report EPA-430/9-74-013, February 1974. 78 p, 7 fig, 40 ref. EPA Contract 68-01-0341.

Descriptors: *Disasters, *Waste water Treatment, *Treatment facilities, *Water pollution control, *Planning, Earthquakes, Floods, Storms, Tornadoes, Tropical cyclones, Tsunami, Acts of God, Damages, Hazards, Negligence, Warning systems, Winds, Hurricanes, Electric power failure, Failures, Sewage effluent.
Identifiers: Emergencies, Preparedness, Municipal spills, Overflows, Plant operation, and Accidents.

A study has been made of emergency planning for municipal wastewater treatment facilities to insure effective continued operation under energency conditions. These emergency conditions could be imposed by natural disasters, civil disorders, strikes, faulty maintenance, negligent operation, or accidents. Over 200 municipal treatment systems were contacted and asked to provide information for this project. This information was used to help identify the principal causes of failures within municipal treatment systems. Information on emergency planning and responses to emergency conditions was provided from these contacts. The results of this study are presented in the form of a manual for the development of emergency operating plans for municipal wastewater treatment systems. The intent is to expand the concepts stated in the Federal Control Act Amendments of 1972. (EPA)
W74-06577

START-UP OF MUNICIPAL WASTEWATER TREATMENT FACILITIES,
Wiley and Wilson, Inc., Lynchburg, Va.
R. D. Rader, R. L. Green, and G. L. Page, Jr.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $1.40. Environmental Protection Agency, Washington, D.C. Office of Water Pro-

gram Operation, Report EPA-43019-74-008, December 1973. 92 p, 3 fig, 2 tab, 42 ref. EPA Contract 68-01-0341.

Descriptors: *Administrative decisions, *Treatment facilities, *Waste water treatment, *Operations, *Laboratory tests, *Sampling, Testing, Analysis, Controls, Activated sludge, Trickling filter, Oxidation lagoons, Anaerobic digestion, Safety, Chlorination, Suspended solids, Hydrogen ion concentration, Alkalinity, Biochemical oxygen demand, Chemical oxygen demand, Pre-treatment(Water), Sewage treatment.
Identifiers: Procedures, Process, Seed sludge, Staffing, Standard operating procedures, Site meetings, Inventory inspection pretestin, Operator training, Settleable solids, Total solids, Volatile solids, Volatile acids, Mixed liquor suspended solids.

This manual provides guidance for putting into initial operation municipal wastewater treatment plant, a new addition to an existing treatment plant, or a change in the mode of the treatment plant's operation so that the treatment plant or process will effectively treat the wastewater in compliance with the specific conditions and limitations established for treatment facility. The manual was developed and prepared with the aid and cooperation of wastewater treatment plant operators and superintendents, start-up experts, the academic community, manufacturers and suppliers of wastewater treatment plant equipment, and literature review of wastewater treatment plant operations and recognized start-up techniques. Information is provided on preparing for actual treatment plant start-up. Preparations for start-up include: staffing the plant, developing standard operating procedures, dry- and wet-run testing of equipment, on-site operator training, safety, and establishing procedures when construction is continuing during start-up. This manual describes start-up procedures for some of the more common pretreatment and primary treatment units; for the specific secondary treatment processes of activated sludge, trickling fileters, stablization ponds and aerated lagoons; and for the sludge handling units and the anaerobic digestion process. The start-up procedures for advanced wastewater treatment units and processes are not considered in this manual. (EPA)
W74-06578

MAINTENANCE MANAGEMENT SYSTEMS FOR MUNICIPAL WASTEWATER FACILITIES,
Wiley and Wilson, Inc., Lynchburg, Va.
J. J. Jennings, Jr., W. M. Johnson, G. L. Page, Jr., W. H. Clingenpeel, and R. L. Green.
For sale by the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402 Price $1.60. Environmental Protection Agency, Washington, D.C. Office of Water Program Operations, Report EPA-430/9-74-004, October 1973. 118 p, 29 fig, 188 ref. EPA Contract 68-01-0341.

Descriptors: *Treatment facilities, *Operation and maintenance, *Municipal wastes, Publications, *Wastewater treatment, Costs, Personnel, Maintenance, *Management, *Operating costs.

This manual has been prepared by the Environmental Protection Agency to provide guidelines to aid plant management in selecting, instituting, and evaluating various maintenance management systems for municipal wastewater treatment plants. The principal background for this work came from the existing maintenance guidelines as outlined in 'Federal Guidelines for Design, Operation and Maintenance of Wastewater Treatment Facilities' as provided by the Environmental Protection Agency. A survey of existing maintenance management systems used by wastewater treatment facilities, industries, and the armed forces were reviewed and input was obtained from persons experienced in maintenance management. This manual includes a separate section on each of the basic features required in a sound maintenance management system. Detailed discussions of the basic features with information on how to establish and implement the system are included. Three examples are provided to aid persons in combining the features into a sound system. The examples are not intended as a rigid format but can be modified to fit the particular plant's requirements. (EPA)
W74-06579

NITROGEN ELIMINATION BY BOGUS ALTERNATION OF AEROBIC/'ANOXIC' CONDITIONS IN 'ORBAL' ACTIVATED SLUDGE PLANTS,
National Inst. for Water Research, Pretoria (South Africa).
R. J. L. C. Drews, and A. M. Greeff.
Water Research, Vol 7, p 1183-1194, 1973. 5 fig, 4 tab, 13 ref.

Descriptors: *Sewage treatment, *Denitrification, *Activated sludge, *Aeration, Pilot plants, Sludge treatment, *Waste water treatment, Nitrogen, Treatment facilities, Ammonia, Aerobic conditions.
Identifiers: Extended aeration, South Africa.

Methods of operation for obtaining maximum nitrogen elimination in the 'Orbal' endless channel extended aeration plant were compared. The most efficient method required balancing of sludge concentration, organic load and oxygen input against one another in such a way that a rapid alternation of aerobic/anoxic conditions was brought about between aeration points in each channel. This resulted in minimal amounts of ammonia and nitrate remaining in the effluent. Automated control of oxygen input and of sludge concentration is considered necessary for consistent maximum nitrogen removal. (DWA)
W74-06605

THE EFFECT OF POLLUTION ON THE VAAL RIVER BARRAGE AND THE QUEST FOR WATER QUALITY,
Rand Water Board, Johannesburg (South Africa).
For primary bibliographic entry see Field 5B.
W74-06607

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION,
California Univ., Riverside. Dept. of Plant Sciences.
V. B. Youngner, and T. E. Williams.
Available from the National Technical Information Service as PB-231 376, $4.50 in paper copy, $1.45 in microfiche. California Water Resources Center, Davis, Contribution No. 145, Technical Completion Report (California Project UCAL-WRC-W-374), 1973. 105 p, 14 fig, 22 tab, 74 ref. OWRR B-158-CAL(1).

Descriptors: *Recirculated water, Irrigation systems, Vegetation effects, Fires, *California, *Return flow, *Water reuse, Waste water disposal, Multiple-purpose project, Water pollution sources.
Identifiers: *Maloney Canyon(Calif), *Greenbelts.

The uncontrolled influx of permanent residents into the seasonally dry mountain areas of southern California has compounded fire hazards and created serious deficiencies in water supply and waste disposal systems of mountain communities. The problem has necessitated the conservation of existing water supplies through the maximum use and reuse of potable and wastewater sources. This need for a recycling of water led to a consideration of wastewater reclamation by a multi-purpose terrestrial disposal system, and the construction, in 1970, of the Maloney Canyon Greenbelt Irrigation Project. The project was designed to examine the feasibility of an effluent-irrigated chaparral ecosystem as a greenbelt fuel-break for fire prevention, and to serve as a renovation system for wastewater recycling. An expanded water monitoring program encompassing analyses of surface and ground waters was implemented as an indicator of areas of wastewater contaminant accumulation. Soils and plants were analyzed for nutrient removal characteristics and patterns of native and introduced vegetation survival and growth were correlated into a feasible design for an effective greenbelt vegetation system. Results appear to be favorable to the project objectives of wastewater renovation and fire suppression through greenbelt establishment. (Snyder-California at Davis)
W74-06608

SURVIVAL IN MATURATION PONDS OF COLIFORM BACTERIA WITH TRANSFERABLE DRUG RESISTANCE,
National Inst. for Water Research, Pretoria (South Africa).
For primary bibliographic entry see Field 5C.
W74-06748

1972 OPERATION OF THE ICPP RARE GAS RECOVERY FACILITY,
Allied Chemical Corp., Idaho Falls, Idaho. Idaho Chemical Programs Operations Office.
C. L. Bendixsen, F. O. German, and R. R. Hammer.
Available from the National Technical Information Service, Springfield, Va., as ICP-1023; $4.00 per copy, $1.45 microfiche. Report No. ICP-1023, March 1973. 24 p, 1 fig, 4 tab, 2 ref.

Descriptors: Operations, Fuels, Effluents, *Krypton radioisotopes, *Xenon, Gases, *Radioactivity, Control system, Cryogenic, Distillation, Retention, Evaluation, Safety, Public health, Fallout, Water pollution sources, Efficiencies, Performance, *Idaho, *Recycling.
Identifiers: Fuel reprocessing, Chemical processing, Dissolution, *Rare gas recovery.

Operation of the Rare Gas Recovery Facility at the Idaho Chemical Processing Plant during FY 1972 resulted in the recovery of 9200 curies of krypton-85 and 600 liters of xenon from off-gas produced during dissolution of spent nuclear fuel elements. Overall recovery efficiencies for krypton and xenon were 44% and 49%, respectively. Operation of a cryogenic distillation process with the potential efficiency of greater than 97% for krypton recovery was demonstrated. (Houser-ORNL)
W74-06822

EFFICIENT PRICING FOR URBAN WASTE WATER RENOVATION,
Connecticut Univ., Storrs. Inst. of Water Resources.
R. Laak, R. Leonard, and H. Kardestuncer.
Available from the National Technical Information Service as PB-231 353, $3.25 in paper copy, $1.45 in microfiche. Completion Report, 1973. 41 p, 4 tab, 5 fig, 6 ref. OWRR B-006-CONN(2). 14-31-0001-3266.

Descriptors: *Waste water treatment, Pricing, *Copper, *Activated sludge, *Mathematical models, *Cost allocation, *Industrial wastes, Effluents, Operations.
Identifiers: Unit processes, Unit operations, Treatment efficiency, Cost estimation.

For nontoxic wastes a pricing system was developed for allocating actual cost in proportion to the marginal costs associated with volume and the weight of selected contaminants. The pricing method can be used for separate allocations of capital cost and operating and maintenance cost. Digital simulation models developed for preliminary design of wastewater treatment systems can be used in estimating marginal costs for volume and weight of major contaminants. Copper affected

unit operations and unit processes of the activated sludge treatment. Activated sludge was capable of retaining a significant portion of the applied copper. The efficiency of the activated sludge aerator and final settling units were a function of copper concentration, mixed liquor suspended solids, organic loading and the overflow rate. The overall effect of copper on treatment was a function of environmental variables. No reliable basis was found for including toxic wastes in a system of charges for industrial wastewater treatment.
W74-06828

QUALITY IMPROVEMENT OF FEEDLOT LAGOON WATER BY PERCOLATION THROUGH SOIL UNDER NATIVE PASTURE,
Kansas Water Resources Research Inst., Manhattan.
W. L. Powers, L. S. Murphy, and B. R. Bock.
Available from the National Technical Information Service as PB-231 355, $3.75 in paper copy, $1.45 in microfiche. Contribution No. 131, January 1974. 50 p, 15 fig, 14 tab, 1 ref. OWRR A-046-KAN(1). 14-31-0001-3516.

Descriptors: *Feedlots, *Percolation, *Soil chemical properties, *Water reuse, *Waste water treatment, Groundwater, *Bromegrass, Potassium, Absorption, Nitrogen, *Phosphorus.

Beef feedlot runoff retained in catchment lagoons was applied as an irrigant for bromegrass to determine the effects of this practice on bromegrass yields, bromegrass N, P, K concentrations and uptake, selected soil chemical properties, and groundwater quality beneath the application area. Average applications of 9.3 and 19.0 cm of diluted lagoon water, 9.5 and 16.6 cm of straight lagoon water, and 8.0 cm of well water in one irrigation season produced no consistent differences. Lagoon water applications produced an accumulation of extractable K in the soil profile at the 0- to 30-cm depth for all treatments; largest accumulation was observed in the straight lagoon water treatment, an increase of from 470 to 588 ppm. Although approximately twice as much P was added in the lagoon water treatments as was removed by the bromegrass in one growing season, the average weak Bray extractable P for the 0- to 300-cm depth and for the 0- to 30-cm depth decreased for all treatments. After the first season of lagoon water applications, a moderate increase in the average water soluble Cl- content of from 3 to 5 ppm was observed for the 0- to 300-cm depth. Analyses of groundwater samples from beneath the application area at depths of 7.6 and 21 m revealed highly significant differences between these depths relative to concentrations of NO3--N, Ca, Mg, K. Na, Cl-, and electrical conductivity values. Concentrations greater than 10 ppm for NO3--N in the shallow wells were common while the mean for all NO3--N values from the deep wells was 0.04 ppm. Mean values of 0.12 and 0.11 ppm were found for NH4+-N in the shallow and deep wells respectively.
W74-06830

AMMONIA-NITROGEN REMOVAL BY BREAKPOINT CHLORINATION,
District of Columbia Dept. of Environmental Services, Washington.
T. A. Pressley, D. F. Bishop, A. P. Pinto, and A. F. Cassel.
Copy Available from GPO Sup Doc, as EP1.23:670/2-73-058, $0.95; microfiche from NTIS as PB-231 378 $1.45. Environmental Protection Agency, Technology Series EPA-670/2-73-058, September 1973. 45 p, 17 fig, 7 tab, 21 ref. EPA Project 11010 EYM. Contract 14-12-818.

Descriptors: *Waste water treatment, *Ammonia, *Nitrogen, Filtration, Oxidation, *Chlorination, Chlorine, Alkalinity, Nutrients, *District of Columbia.
Identifiers: *Breakpoint chlorination, Lime clarification, Free chlorine, Nitrogen trichloride.

In laboratory studies of breakpoint chlorination, sodium hypochlorite oxidized the ammonia in buffered distilled water (with 20 mg/l of NH3-N), raw wastewater, lime clarified and filtered raw wastewater, secondary effluent and lime clarified and filtered secondary effluents to chiefly nitrogen gas. In the oxidation of this buffered water and the wastewaters, only small amounts of NO3-N (0.3 mg/l at pH 5 to 2.0 mg/l at pH 8) and NCl3-N (0.05 mg/l at pH 8 to 0.3 mg/l at pH 5) were produced. The oxidation of ammonia to N2 gas was best accomplished in the pH range 6-8. A Cl:NH3-N ratio of approximately 8:1 was sufficient for the buffered water and the highly treated wastewater. However, increasing Cl:NH3-N ratios (8-10:1) were required as the degree of pretreatment of the wastewater decreased. In the pilot breakpoint operation, chlorine gas with sodium or calcium hydroxide for pH control was efficiently mixed with filtered secondary effluent and with lime clarified and filtered raw wastewater. Greater than 95% of the NH3-N was converted to N2 gas. Operation at controlled pH greater than 6.0 and with low residuals of free Cl2 (2 mg/l) produced essentially no nitrogen trichloride and modest amounts of NO3-N (0.6 mg/l). (Kisenbauer-EPA)
W74-06838

ACTIVATED SLUDGE TREATMENT SYSTEMS WITH OXYGEN,
District of Columbia Dept. of Environmental Services, Washington.
J. B. Stamberg, D. F. Bishop, and A. B. Hais.
Copy Available from CPO Sup Doc as EP1.23:670/2-73-073, $0.90; microfiche from NTIS as PB-231 379 $1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-073, September 1973. 36 p, 11 fig, 4 tab, 15 ref. EPA Project 11010 EYM. Contract 14-12-818.

Descriptors: *Waste water treatment, Sedimentation, Phosphorus, Alkalinity, Biological treatment, *Activated sludge, Oxidation, *Oxygen, Oxygenation, *District of Columbia, Aerobic conditions, Biodegredation, Biochemical oxygen demand, Dissolved oxygen.
Identifiers: *Oxygen activated sludge, *Clarification, Suspended solids, Step aeration, Contact stabilization, Solids handling.

The gas-tight biological reactor with 2.5 hour detention time or less insolubilized the biodegradable organics to less than 5 mg/l of soluble BOD. The organisms in the mixed liquor were maintained between 4000 and 8000 mg/l. Above a solids retention time (SRT) of six days, the rate of activity in the oxygen volatile solids was greater than in a parallel step aeration system. Ninety-five (95) percent of the oxygen supplied was consistently utilized in the staged reactor, which employed co-current liquid and gas flow contacting. The liquid solids separation was accomplished by conventional clarification. The clarification efficiency was a function of mixed liquor concentration, particle shape, particle density and seasonal variation (i.e., temperature, metabolic changes, and load variation). During the warmer temperature periods, the peak overflow rates of 1940 gal/day/sq ft were observed. In colder temperature periods, maximum steady state overflow rates of 975 gal/day/sq ft were obtained. The underflow solids varied with overflow rate, clarifier volume and recycle rate. Underflow concentrations up to 2.5% were obtained. Above an SRT of six days, the total production of solids was significantly less than the solids production in a similarly operated step aeration system. At an SRT of 13 days, 0.35 lb. of solids/lb. of BOD were produced.
W74-06839

LABORATORY OZONATION OF MUNCIPAL WASTEWATERS,
District of Columbia Dept. of Environmental Services, Washington.
S. G. Roan, D. F. Bishop, and T. A. Pressley.
Copy available from GPO Sup Doc as EP/23:670/2-73-075, $0.85; microfiche from NTIS as PB-231 380 $1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-075, September 1973. 38 p, 15 fig, 4 tab, 23 ref. EPA Project 11010 EYM Contract 14-12-818.

Descriptors: Oxidation, *Ozone, *Waste water treatment, Chemical Oxygen demand, Tertiary treatment, Sewage treaetent, Ammonia, *District of Columbia.
Identifiers: *Waste water ozonation, Oxidation efficiency, Nitrogen oxidation, Total organic carbon.

Raw wastewater, secondary effluent, lime clarified and filtered raw and secondary wastewaters, carbon treated wastewaters, and breakpoint chlorinated plus carbon treated wastewaters were ozonated at pH 7.0 over a range of 5.90 minutes contact time. Ozonation of the raw wastewater, with high solids and COD content required impractical ozone dosages for appreciable COD removal. In all effluents, except raw wastewater, 100 mg/l of ozone produced at least a 70% COD removal. Organic oxidation efficiencies in the raw and secondary wastewaters, based upon one atom of available oxygen per molecule of ozone, exceeded 100% indicating that one or more atoms of the ozone molecule or molecular oxygen participated in the organic oxidation mechanism. Variable amounts of organic nitrogen and ammonia were oxidized at pH 7.0 by ozone to nitrate. Organic nitrogen and ammonia oxidation to nitrate increased with increased pretreatment (lower initial COD in the wastewater) and increased pH. Nitrate residuals formed by the oxidation of ammonia and or organic nitrogen at the 70% COD removal level were less than 3 mg/l. The ozone distribution ratio between oxidation of the NOD and COD, and the COD removals as a function of ozone dose suggested that the relative order of oxidation was; easily oxidizable organic material, NH3, TKN, and slowly oxidizable (nearly refractory) organic material. (EPA)
W74-06840

NITROGEN REMOVAL BY AMMONIA STRIPPING,
District of Columbia Dept. of Environmental Services, Washington.
T. P. O'Farrell, D. F. Bishop, and A. F. Cassel.
Copy Available from GPO Sup Doc as EP1.23:670/2-040, $0.65; microfiche from NTIS as PB $1.45. Environmental Protection Agency, Technology Series Report EPA-670/2-73-040, September 1973. 23 p, 9 fig, 1 tab, 8 ref. EPA Project 11010 EYM Contract 14-12-818.

Descriptors: Ammonia, *Mass transfer, Calcium carbonate, Lime, *Waste water treatment, *Scaling, *District of Columbia.
Identifiers: *Air Stripping, *Ammonia removal.

Ammonia removals of up to 90% from lime clarified filtered wastewater were obtained in a five stage counter current cross flow stripping tower using air to liquid rates of 400 to 500 cu ft/gal. Decreases in operating temperatures from 78F to 43F during the cold weather reduced the stripping efficiency by 30% and caused icing in the tower. The variation of stripping efficiency was also studied as a function of the inlet pH of the water and the ratio of the air to liquid rate. The rate of calcium carbonate scaling on the tower was determined for wastewater pH's of 11.5 and 10.5. The heights of transfer units (HTU) were estimated by using a mathematical model and a computer iterative technique. (EPA)
W74-06842

BIOLOGICAL TREATMENT OF FEEDLOT RUNOFF,
Nebraska Univ., Lincoln. Dept. of Civil Engineering.
M. V. O'Neal.

Available from the National Technical Information Service as PB-231 479 $6.25 in paper copy $1.45 in microfiche. MS Thesis, September 1973. 52 p. OWRR A-027-NEB(3).

Descriptors: *Biological treatment, *Feed lots, *Farm wastes, Water quality, Cattle, Nitrates, *Waste water treatment, Organic loading, *Activated sludge, Flocculation, Suspended solids, Chemical oxygen demand, Pilot plants, *Nebraska, Nitrogen compounds.
Identifiers: *Feedlot runoff, Clarifiers.

The purpose of this study was to operate and evaluate the performance of a completely mixed activated sludge unit system. Performance was to be evaluated by comparison to parameters established in the laboratory studies and by ease of operation and maintenance under field conditions. Conclusions reached were: (1)Organic loading of 0.2 gm COD/gm mixed liquor suspended solids (MLSS) or less will maximize waste strength reduction. (2) The clarifier can effectively retain solids in the system. Effectiveness of sedimentation depends upon maintenance of a flocculant sludge and MLSS concentrations not exceeding 6,000 mg/1. (3) The unit is generally maintenance free and easy to operate. Periodic measurements of settled volume provide adequate control of MLSS. (4) Foaming can become quite severe and affect the system by removing solids. Thus, laboratory studies have concluded that the runoff is amenable to aerobic treatment and a field unit was designed applying the results of these studies in order to evaluate the success of such a system in pilot scale operation. The success and subsequent application of this system will depend on the economics involved and the degree of treatment attainable.
W74-06847

EFFECTS OF SEWAGE DISPOSAL AND RECLAMATION ON GROUND WATER QUALITY,
California State Dept. of Public Health, Sacramento. Environmental Sanitation Div.
H. F. Collins.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 66-77, December 1973. 4 tab, 15 ref.

Descriptors: *Waste disposal wells, *Water reuse, *Reclaimed water, *Water quality, Water pollution, Monitoring, Water pollution effects, *California, Artificial recharge, Water spreading.

Waste water spreading operations are used at selected sites in California. The City of Oceanside, followed by the County Sanitation Districts of Los Angeles County, were among the first to employ recharge by a planned spreading operation. Other planned surface recharge operations have been carried out at various locations throughout the state but only four which recharge an aquifer supplying domestic water are in operation at the present time. A few projects in California have investigated the use of reclaimed water as a source of injected water. Pilot studies were carried out from 1952 to 1963 at the Hyperion Sewage Treatment Plant, and from 1965 to 1971 by the Orange County Water District. The effects of percolating waste water on the quality of the groundwater will vary widely from one location to another depending on: (1) application rates, (2) the characteristics of the waste water, (3) geological considerations, (4) the nature of the soil, and many other factors. Constituents in the waste water that are of primary concern from a health viewpoint are biological pathogens, stable organics, and heavy metals. The soil mantle appears to be quite efficient in the removal of bacteria, viruses and many other constituents. In direct injection, the treatment phenomena which occur with percolation through the soil are not provided, nor are they duplicated with groundwater movement. Consequently, the quality of the injected water must be such that it is suitable for the eventual intended uses. The quality must be such that no adverse changes will occur in the underground travel which will impair its use for extraction. (See also W74-06942) (Knapp-USGS)
W74-06948

USE OF WASTE HEAT FOR SOIL WARMING IN NORTH CAROLINA,
North Carolina State Univ., Raleigh. Dept. of Biological and Agricultural Engineering; and North Carolina State Univ., Raleigh. Dept. of Horticultural Science.
R. W. Skaggs, C. R. Willey, and D. C. Sanders.
Paper No. 73-3530 presented at 1973 Winter Meeting, American Society of Agricultural Engineers, Chicago, Ill., Dec. 11-14, 1973, 30p. 13 fig, 1 tab, 9 ref. OWRR A-060-NC(1). 14-31-0001-4033.

Descriptors: *Thermal pollution, *Heated water, *North Carolina, *Soil temperature, Irrigation effects, *Land disposal, Cooling water, Heat transfer, Power plants, *Beneficial use.

A promising alternative for removing waste heat from condenser cooling water is by using the spent cooling water for soil warming, irrigation, and evaporative cooling of soil and plant surfaces. Heat can be transferred to the soil by circulating the heated water through a network of buried pipes. In addition to removing heat, soil warming systems may stimulate crop production (sometimes doubling yield), increase the length of growing seasons, and allow earlier harvesting (and marketing). This paper describes, interprets, and extrapolates field studies of waste heat removal by soil warming in North Carolina in terms of (1) the capacity of the soil system (Wagram sandy clay loam) as a heat sink and its variation over seasons of the year and (2) the temperature regimes maintained when heated waters are used for soil warming in combination with subsurface irrigation and low volume surface irrigation. Based on extrapolation of experimental data, the land area required to handle the waste heat from a 1,000 megawatt nuclear power plant in North Carolina would be about 13,100 acres during the hottest months, based on a soil warming system of one-inch diameter plastic pipes buried 20 inches deep and 20 inches apart and a temperature reduction from 100F to 80F. The acreage required can be reduced using sprinkler irrigation and subsurface irrigation. Acreage requirements also vary with ambient temperature (much lower in winter months); pipe diameter, and spacing; flow rate; entering water temperature, and temperature differential, i.e., the difference between inlet and outlet temperatures. (McJunkin-North Carolina)
W74-07000

SEARCH FOR A METHOD FOR SANITIZING SEWAGE FROM HELMINTH EGGS USING AGROCHEMICAL MEANS. (PRELIMINARY COMMUNICATION), (IN RUSSIAN),
Institute of Medical Parasitology and Tropical Medicine, Moscow (USSR).
Yu. A. Chefranova.
Med Parazitol Parazit Bolezn. Vol 41, No 4, p 440-444, 1972. (English summary).
Identifiers: Agrochemicals, *Ammonium water, Ascarid eggs, *Helminth eggs, Methodology, *Farm wastes, *Sewage treatment, Water pollution control, Waste water treatment.

A search was made among fertilizers used in agriculture of substances possessing an ovocidal effect on ascarid eggs in sewage. The addition of ammonium water to sewage could be accompanied by death of ascarid eggs. The ovocidal effect was observed when the content of ammonium was 2.5% or more and was similar in the following substrates: feces water, feces mixture with urine, sewage precipitate and pig manure. The ovocidal effect of ammonium water depends on concentration, exposure and temperature.--Copyright 1973, Biological Abstracts, Inc.
W74-07018

INVESTIGATION OF BREWING WATER TREATMENT,
For primary bibliographic entry see Field 5A.
W74-07023

5E. Ultimate Disposal Of Wastes

GEOLOGIC AND HYDROLOGIC BACKGROUND FOR SELECTING SITE OF PILOT-PLANT REPOSITORY FOR RADIOACTIVE WASTE,
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 5B.
W74-06820

A CRITICAL REVIEW OF SOLID RADIOACTIVE WASTE PRACTICES AT NUCLEAR POWER PLANTS,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-06825

MATHEMATICAL MODEL FOR BARGED OCEAN DISPOSAL OF WASTES,
Tetra Tech, Inc., Pasadena, California.
For primary bibliographic entry see Field 5B.
W74-06837

ON THE SELECTION OF A GROUND DISPOSAL SITE BY SENSITIVITY ANALYSIS,
Kyoto Univ., (Japan). Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 5B.
W74-06858

THE EFFECTS OF WASTE DISPOSAL IN THE NEW YORK BIGHT. SECTION 3: ZOOPLANKTON STUDIES.
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Sports Fisheries Marine Lab.
For primary bibliographic entry see Field 5C.
W74-06866

THE EFFECTS OF WASTE DISPOSAL IN THE NEW YORK BIGHT. SECTION 5: CHEMICAL STUDIES.
National Marine Fisheries Service, Highlands, N.J. Sandy Hook Sports Fisheries Marine Lab.
For primary bibliographic entry see Field 5C.
W74-06867

THE EFFECTS OF WASTE DISPOSAL IN THE NEW YORK BIGHT. SECTIONS 7, 8, AND 9.
National Marine Fisheries Service, Highlands, N. J. Sandy Hook Sports Fisheries Marine Lab.
For primary bibliographic entry see Field 5C.
W74-06868

SLUDGE DISPOSAL TO LAND,
California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 5B.
W74-06950

5F. Water Treatment and Quality Alteration

INFORMATION RESOURCE: FINAL REPORT WATER POLLUTION CONTROL IN WATER UTILITIES,
American Water Works Association Research Foundation, New York.
H. A. Faber, A. D. Nardozzi, and M. J. Taras.

Copy available from GPO Sup Doc as EP1.23:660/2-73-020, $1.05; microfiche from NTIS as PB $1.45. Environmental Protection Agency Technology Series Report EPA-660/2-73-020, December 1973. 64 p, 3 tab. EPA Project 12120 EUR.

Descriptors: *Sludge disposal, *Sludge treatment, *Abstracts, *Water treatment, Water purification, Utilities, Information exchange, Treatment facilities, Surveys, Water pollution control.
Identifiers: *Information clearing-house, *Information resource, *Water utility sludge, Information dissemination.

The goals of this effort were the collection, coordination, and communication of information of a scientific, technical, and administrative nature relative to control of pollution caused by wastes from water treatment plants, in accordance with the recommendations of an industry advisory committee. It covers laboratory tests underway or completed at widely dispersed water treatment plants throughout the country on the applicability of polymers as primary coagulants, coagulant aids, and sludge conditioning agents, with the objective of alleviating the problem of water treatment plant waste disposal. Also included is the evaluation in cooperating laboratories of analytical methods suitable for the physical and chemical examination of the sludge and sludge solids from water treatment plants. A total of 121 abstracts of technical articles were prepared on the varied aspects of water treatment plant waste disposal: waste problems at 26 named water treatment plants or geographical locations, waste treatment in the new water treatment plants, water conditioning practices, characteristics of alum, iron, and softening wastes; treatment of filter washwater; treatment of sludge by the reclamation of alum, lime, and magnesium carbonate, and by dewatering processes involving centrifugation, drying beds, filter pressing, freezing, and vacuum filtration; subsurface disposal and disposal of brine wastes. (EPA)
W74-06527

5G. Water Quality Control

PROCESSING, CHEMICAL COMPOSITION AND NUTRITIVE VALUE OF AQUATIC WEEDS,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 4A.
W74-06502

TECHNICAL AND ECONOMIC EVALUATION OF COOLING SYSTEM BLOWDOWN CONTROL TECHNIQUES,
Wapora, Inc., Washington, D.C.
For primary bibliographic entry see Field 5D.
W74-06510

EVAPORATION FROM BRINE STORAGE RESERVOIRS,
Oklahoma State Univ., Stillwater. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2D.
W74-06517

TERTIARY TREATMENT WITH A CONTROLLED ECOLOGICAL SYSTEM.
Las Virgenes Municipal Water District, Calabasas, Calif.
For primary bibliographic entry see Field 5D.
W74-06524

HYPOLIMNION AERATION WITH COMMERCIAL OXYGEN - VOL. I - DYNAMICS OF BUBBLE PLUME,
Texas Univ., Austin.
For primary bibliographic entry see Field 5D.
W74-06525

HYPOLIMNION AERATION WITH COMMERCIAL OXYGEN - VOL. II - BUBBLE PLUME GAS TRANSFER,
Texas Univ., Austin.
For primary bibliographic entry see Field 5D.
W74-06526

EMERGENCY PLANNING FOR MUNICIPAL WASTEWATER TREATMENT FACILITIES,
Wiley and Wilson, Inc., Lynchburg, Va.
For primary bibliographic entry see Field 5D.
W74-06577

WATER QUALITY CONTROL,
Pretoria Univ. (South Africa).
F. A. Van Duuren.
The Civil Engineer in South Africa, Vol 16, No 2, p 66-68, February 1974. 2 fig.

Descriptors: *Water quality control, *Water pollution, *Systems analysis, Water requirements, Water resources development, Water supply development, Water utilization, Consumptive use, Water demand, Water quality standards.
Identifiers: *South Africa.

The availability of water in South Africa in relation to the demand for water on the part of the various sectors of the community is reviewed. Differences in the quality of water from various sources are discussed in relation to the quality standards applicable to water used for industrial, agricultural and domestic purposes. The application of a systems approach to the regulation of water quality is advocated. (DWA)
W74-06603

ECOLOGICAL AND PHYSIOLOGICAL IMPLICATIONS OF GREENBELT IRRIGATION,
California Univ., Riverside. Dept. of Plant Sciences.
For primary bibliographic entry see Field 5D.
W74-06608

DEVELOPING REGION IN SELF-AERATED FLOWS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik, Staunanlagen und Wasserversorgung.
For primary bibliographic entry see Field 8B.
W74-06739

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED ALVIN W. VOGTLE NUCLEAR PLANT UNITS 1, 2, 3, AND 4.
Directorate of Licensing (AEC), Washington, D. C.
For primary bibliographic entry see Field 5B.
W74-06821

A REVIEW OF SOVIET DATA ON THE PEACEFUL USES OF NUCLEAR EXPLOSIONS,
California Univ., Livermore. Lawrence Livermore Lab.
For primary bibliographic entry see Field 6B.
W74-06823

BUFFER CAPACITY IN AQUATIC ECOSYSTEMS,
Georgia Inst. of Tech., Atlanta. Environmental Resources Center.
For primary bibliographic entry see Field 5B.
W74-06829

MODELING AND OPTIMIZATION OF TRANSIENT COOLING WATER DISCHARGE FROM POWER GENERATING PLANTS,
Kansas State Univ., Manhattan. Dept. of Industrial Engineering.
For primary bibliographic entry see Field 5B.
W74-06832

THE SELECTIVE REMOVAL OF NITRATE AND NITRITE FROM POLLUTED WATER,
Kansas State Univ., Manhattan. Dept. of Chemistry.
C. E. Meloan.
Available from the National Technical Information Service as PB-231 471, $3.25 in paper copy, $1.45 in microfiche. Kansas Water Resources Research Institute, Manhattan, Contribution No. 138, March 1974. 34 p, 6 tab, 28 ref. OWRR A-033-KAN(1). 14-31-0001-3216.

Descriptors: *Nitrates, *Nitrites, *Resins, Water pollution, *Ion exchange, Separation techniques, *Waste water treatment.
Identifiers: Diethylaminoethanes, Nitrobenzoates, Bio-Rex 70, Bio-Gel P-300, Bio-Gel P-30, Bio-Gel P-4, Nitron.

The basic idea was to add known nitrate selective compounds to currently available ion exchange resins to produce a resin that would selectively remove nitrate from contaminated waters, be easy to handle, and be capable of regeneration. Three such resins were made and tested and were found to have some selectivity but were entirely inadequate with regards to capacity. The compounds used were alpha-phenyl-alpha-hydroxy-beta-diethylaminoethane and alpha-phenyl-beta-diethylaminoe-thyl-rho-nitrobenzoate on Bio-Rex-70 and Bio-Gel P-300, P-30 and P-4. Studies were also begun using nitron and N-diethylbenzohydrylamine.
W74-06833

THE ENVIRONMENTAL IMPULSE AND ITS COMPETITORS: ATTITUDES, INTERESTS, AND INSTITUTIONS AT LAKE TAHOE,
California Univ., Davis. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W74-06843

THE PRESENT AND FUTURE STATUS OF EASTERN NORTH CAROLINA WETLANDS,
North Carolina Univ., Chapel Hill. Dept. of Geography.
For primary bibliographic entry see Field 2L.
W74-06850

EXPLORING ENERGY CHOICES.
Energy Policy Project, Washington, D.C.
For primary bibliographic entry see Field 6D.
W74-06879

PROCEDINGS NINTH BIENNIAL CONFERENCE ON GROUND WATER.
For primary bibliographic entry see Field 5B.
W74-06942

PROTECTING GROUND WATER QUALITY--SOME PROBLEMS AND SOLUTIONS,
Luhdorff (E.E.) Co., Woodland, Calif.
For primary bibliographic entry see Field 5B.
W74-06946

THE FEDERAL ROLE AND LEGISLATIVE TRENDS IN CONTROL OF GROUND WATER QUALITY,
Environmental Protection Agency, San Francisco, Calif. Region IX.
B. D. Clark.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres

Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 104-109, December 1973.

Descriptors: *Water pollution control, *Groundwater, *Federal water pollution control act, Monitoring, Regulation, Water quality act, Planning, *California, Water law.

The passage of PL92-500 authorizes the Environmental Protection Agency and the various states to control groundwater quality. The EPA has authority in groundwater quality control in four areas--monitoring and evaluation, research and demonstration, planning and management, and enforcement--with primary emphasis in monitoring and evaluation to provide an assessment of the problem and derive means for control. (See also W74-06942) (Knapp-USGS)
W74-06952

CURRENT STATE BOARD ACTIVITIES IN GROUND WATER QUALITY MANAGEMENT,
California State Water Resources Control Board, Scramento.
P. A. Rogers.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 110-113, December 1973.

Descriptors: *Water pollution control, *Groundwater, *Federal water pollution control act, Monitoring, Regulation, Water quality act, Planning, *California, Water law.

Some activities of the California State Water Resources Control Board under the new federal and state law are discussed particularly in relation to groundwater. Probably the most significant aspect of the new law is that it has forged a new partnership between the Federal Environmental Protection Agency and the State. The State Board, by contract, is preparing comprehensive water quality control plans for each of the 16 hydrologic basins in the State. This is a $7 million effort which is about 75% completed. These plans will be the basis for setting State and regional water quality standards, the disbursement of State and federal grant funds for construction of waste water treatment facilities, and for the delineation of water quality objectives to achieve and maintain the beneficial uses of the state's waters. These plans designate the waste water facilities to be built in California for the next 20-30 years. In addition to surface waters, the basin plans also concern groundwater quality management, particularly problems of salt balance, effects of waste water disposal, and problems associated with interbasin transfer of water. Of major concern are the effects from both point and nonpoint sources. (See also W74-06942) (Knapp-USGS)
W74-06953

IMPACT OF WATER POLLUTION CONTROL LEGISLATION ON MEETING FUTURE WATER NEEDS IN CALIFORNIA,
California State Dept. of Water Resources, Sacramento.
J. R. Teerink.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 114-118, December 1973.

Descriptors: *Water pollution control, *Groundwater, *Federal water pollution control act, Monitoring, Regulation, Water quality act, Planning, *California, Water law.

In the context of meeting future water needs in California, the opportunities presented by water pollution control legislation are in two areas. Planning of water supply and waste disposal, both quantity and quality, is being integrated. Water pollution control and water quality legislation promote more efficient use of water, including the use of groundwater storage, as compared to surface dams and reservoirs. Waste-water reclamation is the major link between waste disposal and water supply; it is the mechanism which makes it possible for good quality water to be used again before ultimate disposal. Waste-water reclamation often produces water of appropriate mineral quality to be recharged to a groundwater basin. Once in the basin, it may be pumped for any use, including domestic. The State Department of Public Health is considering allowing up to 10% of the recharge to a basin to be reclaimed water. (See also W74-06942) (Knapp-USGS)
W74-06954

GROUND WATER POLLUTION--FROM THE WASTE DISCHARGER'S VIEWPOINT,
Gilbert (J.B.) and Associates, Sacramento, Calif.
J. B. Gilbert.
In: Proceedings of 9th Biennial Conference on Ground Water, Sept 13-14, 1973, Francisco Torres Conference Center, Goleta, Calif: California University Water Resources Center Report No 26, p 119-125, December 1973.

Descriptors: *Water pollution control, *Groundwater, *Federal water pollution control act, Monitoring, Regulation, Water quality act, Planning, California, Water law.

Because of new water pollution legislation in California, dischargers have an increasingly realistic view of the beneficial use of waste waters. They also tend to have a pragmatic view of groundwater quality, one that is frequently influenced by short-term economic or operational considerations as opposed to long-term regional water resources management. Groundwater management must be accomplished for each basin, following a definitive plan. The discharge of concentrated pollutants with irreversible long-term damage should be avoided. The control of total dissolved solids and other salts must be determined separately, considering the long-term usefulness of the basin, alternative water supplies, and the best use of the waste water containing the salts. (See also W74-06942) (Knapp-USGS)
W74-06955

THE NATIONAL ENVIRONMENTAL POLICY ACT AND THE LICENSING PROCESS: ENVIRONMENTALIST MAGNA CARTA OR AGENCY COUP DE GRACE,
A. W. Murphy.
Columbia Law Review, Vol 72, No 6, p 963-1007, October 1972. 176 ref.

Descriptors: *Agencies, *Nuclear powerplants, *Environmental effects, *Electric power, Water quality standards, Public utilities, Reasonable use, Water policy, Industries, Administration, Electric powerplants, Legislation, Legal aspects, Regulation.
Identifiers: National Environmental Policy Act(NEPA).

An extensive and comprehensive analysis is presented of the National Environmental Policy Act (NEPA) and the licensing process of the Atomic Energy Commission for facilities engaged in the production of electric power. The job required of the Atomic Energy Commission by NEPA, as interpreted by the courts, is one which the agency cannot perform, and, in any event, one which the licensing process as it currently exists is ill-designed to handle. The task imposed on an already overburdened structure has had, at least temporarily, a disastrous impact. The situation is described and the reasons for the crisis are analyzed. Suggestions are offered for changes in the structure of the licensing process to enable the AEC and other agencies to better deal with environmental questions. For power plant licensing, certain steps seem to be necessary before the goals of NEPA can be realized. Congress must make some specific judgments as to energy policy, structure of the power supply industry, organization of the regulatory process, and, more fundamentally, national growth policy. (Mockler-Florida)
W74-06963

COASTAL WETLANDS IN NEW ENGLAND,
D. P. Hill.
Boston University Rev., Vol 52, p 724-762, Fall 1972. 207 ref.

Descriptors: *Legal aspects, *Wetlands, *Coastal marshes, Swamps, Aquatic Environment, Land reclamation, Wildlife conservation, Governments, Water injury, Terrestrial habitats, Land use, Regulation, Environment, Environmental effects, Eminent domain, Adjacent land owners, High water mark.

A comprehensive analysis is presented of coastal wetlands in New England and the problems faced by those interested in the regulation and protection of coastal wetlands resources through the legal process. The most immediate threat to the wetlands lies in their direct alteration and destruction by man and, therefore, land use controls should be used as the essential ingredient of a viable wetlands program. Moreover, a constitutional interpretation which would allow the states to protect valuable public resources by denying individual landowners the right to interfere with natural systems is essential. Also, effective control of marsh areas located above the high water line, which are held extensively in private hands, is critical to effective conservation. Such control is confused by legal uncertainty over the 'taking' question raised by state regulations. The prospects for New England coastal wetlands may well rest on the shoulders of those in the legal profession concerned and imaginative enough to devise acceptable machinery for effective regulation and preservation. (Mockler-Florida)
W74-06967

WHATEVER HAPPENED TO TVA,
For primary bibliographic entry see Field 6E.
W74-06968

WILL MUNICIPAL SEWAGE CONTINUE TO THREATEN PRIMARY WATER-CONTACT RECREATION: AN APPRAISAL OF THE 1972 WATER POLLUTION CONTROL ACT,
D. J. Kuchenbecker, and D. E. Long.
Rutgers-Camden Law Journal, Vol 4, p 260-288, Spring 1973. 242 ref.

Descriptors: *Water pollution, *Federal Water Pollution Control Act, *Legislation, Permits, Water quality control, Sewage disposal, Waste, Environmental protection, Water resources, Recreation demand, Sewage, Sewage treatment, Water pollution sources, Recreation, Water, Water quality, Water quality standards, Effluents.
Identifiers: Environmental quality, Discharge control, Effluent limitations.

Increasing demands on the Nation's water resources for recreational activities and continuing deterioration of the aquatic environment, largely due to negligent discharge of waste into the waterways, led Congress to enact the Water Quality Act of 1965 as an amendment to the Federal Water Pollution Control Act (FWPCA). The FWPCA as then amended required states to submit water quality standards for review by the Secretary of Interior who would approve those which protected public health and welfare. Weaknesses persisted, however, leading Congress to enact the FWPCA Amendments of 1972. Four areas of the 1972 amendments are of special significance to water recreationists. These areas are: (1) financial authorization to assist states in construction of

necessary sewage treatment plants; (2) effluent limitations at point of discharge instead of water quality standards; (3) requirement that municipalities obtain a permit to continue discharges in Nation's waters; and (4) streamlining of enforcement procedures. By enactment of the FWPCA Amendments, Congress set in motion a forceful program to meet demands of water recreationists nationwide. (Daniels-Florida)
W74-06969

THREE-YEAR EVOLUTION,
For primary bibliographic entry see Field 6G.
W74-06970

CONSERVATIONISTS GO TO COURT--PART 1,
For primary bibliographic entry see Field 4D.
W74-06971

INDUSTRIAL DEVELOPMENT--POLLUTION.
For primary bibliographic entry see Field 6E.
W74-06976

CLEANING AGENTS.
For primary bibliographic entry see Field 6E.
W74-06977

SEWER CONSTRUCTION.
For primary bibliographic entry see Field 6E.
W74-06978

SEWAGE TREATMENT FACILITIES, STATE GRANTS.
For primary bibliographic entry see Field 6E.
W74-06979

SEWAGE COLLECTION FACILITIES.
For primary bibliographic entry see Field 6E.
W74-06980

REGIONAL WATER AND SEWER DISTRICTS: RIGHTS, POWERS AND DUTIES.
For primary bibliographic entry see Field 6E.
W74-06981

WATER POLLUTION--SUMMER INTERN PROGRAM.
For primary bibliographic entry see Field 6E.
W74-06982

CHOCTAWHATCHEE RIVER AND HOLMES CREEK, FLORIDA, PERMIT APPLICATION BY FLORIDA GAME AND FRESH WATER FISH COMMISSION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 4A.
W74-06985

LEGAL AND ADMINISTRATIVE ASPECTS OF AN AQUACULTURE POLICY FOR HAWAII, AN ASSESSMENT,
Hawaii State Dept. of Planning and Economic Development, Honolulu.
For primary bibliographic entry see Field 6E.
W74-06992

PROPOSAL FOR OKLAWAHA RIVER, OCALA NATIONAL FOREST, FLORIDA, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Forest Service (USDA), Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-06993

RATIFICATION OF PROPOSED CONVENTION ON THE PREVENTION OF MARINE POLLUTION BY DUMPING OF WASTES AND OTHER MATTER (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of State, Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-06994

URBANIZATION AND HUMAN HEALTH,
T. Bakacs.
Akademiai Kiado: Budapest, Hungary, 1972. 168 p, Illus. Maps, Price $7.00.
Identifiers: Agricultural pollution, Air pollution, Chemicals, *Ecology, Sanitation, Soil, *Urbanization, *Public health, Water pollution, Cities, Human population, Publications.

The basic biological problems of urbanization, such as the direct and indirect factors responsible for the disruption of a balanced ecology, are discussed. The extent to which the increasingly artificial environment and agricultural chemicals are responsible for this imbalance is examined. The measures necessary for the prevention of unknown long-term reactions are discussed. Air and water pollution, inadequate sewage treatment and complex health injuries connected with the urban environment are analyzed. Part 1 (Man and his Environment) discusses human ecosystems, population explosion, and the introduction of biologically active agents into the environment. Part 2 (Urbanization Induced Health Hazards) discusses the processes of urbanization, air pollution, water supply and sanitation, problems of preserving soil quality in urban areas and the complexity of urbanization noxae. Part 3 (Conclusions and Perspectives) discusses economic and demographic conclusions and future tasks and perspectives. Numerous diagrams, tables, graphs and photographs are included and each section ends with an extensive list of references.--Copyright 1973, Biological Abstracts, Inc.
W74-07017

CONTROL OF MOSQUITOES BREEDING IN RICE-FIELDS,
Microbiological Research Establishment, Salisbury (England).
G. Surtees.
J Trop Med Hyg. Vol 74, No 12, p 255-259. 1971.
Identifiers: *Breeding(Mosquitoes), Environment, Human diseases, Insecticides, Irrigation, *Mosquito control, *Rice fields, Water pollution control.

The different types of control measures used are reviewed and their relative effectiveness indicated. Future research priorities are proposed with particular reference to environmental manipulation. The purpose of these techniques is to reduce numbers of mosquitoes and so the level of transmission of disease agents to man. Although chemical poisons sometimes reduce larvae, they are not satistifactory for long time control. Agricultural irrigation schemes with environmental control offer long term alternatives. Environmental pollution and the toxicological hazard of insecticides on growing food plants and the development of insecticide-resistant strains of insects are avoided.--Copyright 1973, Biological Abstracts, Inc.
W74-07041

OBSERVATIONS ON GAMBUSIA AFFINIS INTRODUCED INTO TOKUSHIMA AS A NATURAL ENEMY OF MOSQUITOES, (IN JAPANESE),
Laboratory of Mosquito Control, Tokushima (Japan).
H. Sato, S. Okubo, M. Sasa, Y. Wada, and M. Motoki.
Jap J Sanit Zool. Vol 23, No 2, p 113-127. 1972. Illus.
Identifiers: Aedes-Dorsalis, Anopheles-Sinensis, Culex-Pipiens-Pallens, Culex-Tritaeniorhynchus, Eradication, *Gambusia-Affinis, *Japan(Tokushima), *Malaria control, Mosquitoes, Rice paddies, *Poeciliid fish.

The topminnow, G affinis (Baird et Girard, 1853), is a viviporous poeciliid fish native to the southern USA, and was introduced into a number of countries mainly for malaria control. In Japan, the fish was imported in 1916 via Hawaii and Taiwan, and was found recently to be breeding widely in polluted waters in and around the city of Tokyo. Tokushima is situated on the delta of Yoshino River, where tremendous number of mosquitoes breed every year in swamps, ditches and rice paddies difficult to drain. Surveys were carried out on the larval breeding places, and on the seasonal prevalence of adults with light traps set at 6 stations. Of 14 spp. of mosquities found in this area, Culex pipiens pallens was predominant and most widely distributed, while Anopheles sinensis and C. tritaeniorhynchus were also found abundantly in some swamp areas. In some salt marshes near the sea coast, tremendous breeding of Aedes dorsalis was observed in the rainy seasons. Under such environmental conditions, the introduction of Gambusia might be an effective measure for the control of mosquitoes. Gambusia was especially successful and effective in salt water marshes where Aedes dorsalis were breeding. Complete eradication of the mosquito larvae was achieved in these areas.--Copyright 1973, Biological Abstracts, Inc.
W74-07048

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

APPLICATION OF DDDP IN WATER RESOURCES PLANNING,
Illinois Univ., Urbana. Dept. of Civil Engineering.
V. T. Chow, and G. Cortes-Rivera.
Available from the National Technical Information Service as PB-231 231 $7.75 in paper copy, $1.45 in microfiche. Illinois Water Resources Center, Urbana, Research Report No. 78, January 1974, 89 p, 22 fig, 10 tab, 13 ref. OWRR B-060-ILL(4).

Descriptors: *Dynamic programming, Systems analysis, *Planning, *Project planning, *Optimization, Optimum development plans, Multiple-purpose projects.
Identifiers: *Hydroeconomic analysis, *Discrete differential dynamic programming.

A research program on advanced methodologies for water resources planning is presented. It summarizes the various achievements accomplished during the period of the project. The main portion of the project is devoted to the presentation of a working manual for use by practicing water resources engineers and analysts, showing the application of the discrete differential dynamic programming (DDDP). The brief theoretical background of the DDDP methodology and a review of the principal aspects of its theory are included. Then, a detailed description of the DDDP methodology is given, giving emphasis to the key steps of its procedure. The DDDP methodology as a means to solve already formulated dynamic programming problems is proposed. For illustrative purposes, three examples are given to show the application of the DDDP methodology in the solution of optimization problems arising from the planning and operation of the complex water resources projects.
W74-06503

NETWORK ANALYSIS OF CONJUNCTIVELY OPERATED GROUND WATER-SURFACE WATER SYSTEMS,
Illinois Univ., Urbana. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4B.
W74-06504

WATER QUALITY CONTROL,
Pretoria Univ. (South Africa).
For primary bibliographic entry see Field 5G.
W74-06603

TECHNIQUES FOR IDENTIFYING AND EVALUATING MARKET AND NONMARKET BENEFITS AND COSTS OF WATER RESOURCE SYSTEMS.
Texas Water Development Board, Austin. Systems Engineering Div.
For primary bibliographic entry see Field 6B.
W74-06852

6B. Evaluation Process

GEOGRAPHY OF WATERFOWL RESOURCES OF THE SOVIET UNION. CONDITION OF RESERVES.
Available from the National Technical Information Service as TT-71-53022, $3.00 in paper copy, $1.45 in microfiche. Trans. of Geografiya Resursov Vodoplavaeushchikh Palits v SSSR, 1972. 279 p, 41 tab.

Descriptors: *Geographical regions, *Water birds, *Population, *Protection, Ducks(Wild), Seasonal, Game birds, Breeding, Migration, Hunting, Productivity, Reproduction, Geese(Wild), Management, Marketing, Ecological distribution, Assay, Analytical techniques, Distribution, Nesting, Nesting cover.
Identifiers: *Soviet Union, *Game refuges, Swans, Cootes.

To determine a basic norm of waterfowl hunt kills, the state and distribution of the bird population, changes of the game in different years relative to conditions of breeding and wintering, and the number of birds killed by hunters should be known. Information from the entire territory of the USSR is assembled. The forms and degrees of participation of organizations for protection of bird wintering grounds should be determined for game management. To give a clear picture of waterfowl populations, mass ringing of the birds is necessary. Effects of closing the spring shooting season is discussed. An experiment was carried on to evaluate the number of waterfowl shot in the Soviet Union. Results are given of the first all-Russian count of water fowl in August 1963. Seasonal geographical distribution of pintails, migration of white fronted geese, and migration and breeding of waterfowl generally are given. Waterfowl populations are described in various areas of the north European USSR, northwest European USSR, central regions of European USSR, eastern European USSR, Azov-Black Sea areas, and the Trans Caucus, especially southeastern Trans Caucus, and the northern part of the Caspian Sea. (Jones-Wisconsin)
W74-06559

DEEP PLOWING - AN ENGINEERING APPRAISAL,
Agricultural Research Service, Beltsville, Md.
For primary bibliographic entry see Field 3F.
W74-06590

LAND USE OF NORTHERN MEGALOPOLIS,
Dartmouth Coll., Hanover, N. H.
For primary bibliographic entry see Field 4A.
W74-06630

A MULTIDISCIPLINARY SURVEY FOR THE MANAGEMENT OF ALASKAN RESOURCES UTILIZING ERTS IMAGERY,
Alaska Univ., College.
For primary bibliographic entry see Field 4A.
W74-06633

MULTIDISCIPLINARY APPLICATION OF ERTS-1 DATA TO NORTH CAROLINA NATURAL RESOURCE MANAGEMENT,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 4C.
W74-06682

NATURAL RESOURCE INVENTORY AND MONITORING IN OREGON WITH ERTS IMAGERY,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 4A.
W74-06683

RESOURCE MANAGEMENT IMPLICATIONS OF ERTS-1 DATA TO OHIO,
Ohio Dept. of Economic and Community Development, Columbus.
For primary bibliographic entry see Field 4A.
W74-06684

USE OF ERTS-1 DATA FOR REGIONAL PLANNING IN THE METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS--A SHORT BRIEF,
Metropolitan Washington Council of Governments, D.C. Remote Sensing Project.
For primary bibliographic entry see Field 4A.
W74-06700

RELATIONSHIPS BETWEEN REMOTELY SENSED FISHERIES DISTRIBUTION INFORMATION AND SELECTED OCEANOGRAPHIC PARAMETERS IN THE MISSISSIPPI SOUND,
National Marine Fisheries Service, Pascagoula, Miss. Southeast Fisheries Center.
For primary bibliographic entry see Field 7B.
W74-06708

A REVIEW OF SOVIET DATA ON THE PEACEFUL USES OF NUCLEAR EXPLOSIONS,
California Univ., Livermore. Lawrence Livermore Lab.
M. D. Nordyke.
Available from the National Technical Information Service, Springfield, Va., as Rept No. UCRL-51414; $4.00 per copy, $1.45 microfiche. Report No. UCRL-51414, June 1973. 50 p, 33 fig, 3 tab, 41 ref, append.

Descriptors: *Nuclear explosions, *Benefits, *Reviews, Research and development, Natural resources, Gas, Water resource development, Oil, Mineral energy, Water storage, Reservoirs, Craters, Channels, Secondary recovery(Oil), Storage, Seismology.
Identifiers: *Peaceful uses, *Public benefits.

Over the last several years through a series of international meetings sponsored by the International Atomic Energy Agency (IAEA) and a number of publications, the Soviet Union has disclosed that they have a very active program for developing peaceful uses of nuclear explosions (PNE) in their national economy. They have described the results of 14 experimental and industrial explosions designed to develop nine different applications in the petroleum, gas, and minerals industries as well as for water resources development. However, when one considers the large number of large unidentified seismic events that have been reported over the last seven years in areas of the Soviet Union outside the normal nuclear-weapon test areas, it is obvious that they have an even more active program than they have publicly described, one that must be approaching a routine industrial technology in some areas. The PNE program that the Soviets have publicly discussed in various reports and at various meetings is summarized and, when appropriate, compared to data from the U.S. Plowshare Program. (Houser-ORNL)
W74-06823

WATER SUPPLY MANAGEMENT ALTERNATIVES FOR RHODE ISLAND,
Analytic Sciences Corp., Reading, Mass.
For primary bibliographic entry see Field 6D.
W74-06827

INTERGOVERNMENTAL RELATIONS AS SEEN BY FLORIDA STATE LEGISLATORS: LAND USE AND WATER RESOURCE PROBLEMS,
Florida Atlantic Univ., Boca Raton.
K. E. Hamm.
Available from the National Technical Information Service as PB-231 481 $8.75 in paper copy, $1.45 in microfiche. MA Thesis, 1973. 102 p, 18 tab, 30 ref. OWRR A-020-FLA(2) 14-31-0001-3809.

Descriptors: *Attitudes, Inter-agency cooperation, *Land use, *State governments, Local governments, Federal government, *Governmental interrelations, *Political aspects, *Water resources development.

The major purposes were (1) to ascertain legislators' perceptions of intergovernmental relations for policy issues and (2) to seek an explanation for these perceptions. The central focus was on the 1972 Florida Legislature. Specifically, the focus was on the legislators' perceptions with regards to land use and water resource problems in Florida. The study found that the greater the perceived seriousness of sewage treatment, water pollution, open space preservation, water supply and planning and zoning problems, the greater the preference for a governmental policy emphasizing shared responsibility among local, state and federal governments. On the other hand, the majority of the legislators perceived 'traditional' land use and water resource problems--droughts, drainage and floods--not to be as severe as the 'contemporary' problems. Therefore, the legislators preferred to have only a single level of government be responsible for solving the problem. The second major area of analysis dealt with the degree to which state, federal and local governments were to be involved in either competitive or cooperative intergovernmental relations. For land use and water resource problems, the state was mentioned by the legislators in over 70 per cent of the replies but with the majority of these involving cooperation with either local governments or local and federal governments. Legislators seem to regard the state as the unit of government where basic responsibility for domestic problem solution should be located when the problem is not severe; but this attachment to the state decreases as problem intensity increases.
W74-06845

AREA FINANCING OF WATER RESOURCE DEVELOPMENT IN WEST MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
W. R. Maki.
Available from the National Technical Information Service as PB-231 476 $4.75 in paper copy, $1.45 in microfiche. University of Minnesota, St. Paul, Water Resources Research Center. Bulletin 66, January 1974. 123 p, 7 fig, 56 tables, 94 ref. OWRR B-044-Minn(3).

Descriptors: *Financing, *Water Resources Development, *Planning, *Minnesota, *Alternative planning, Economic efficiency.
Identifiers: Area Product Accounts, Income accounts, *Public financing Potentials.

A 14-county environmental planning area in West Minnesota was identified for the purpose of studying financing alternatives in water resource development. Altogether, 719 units of local government (exclusive of the newly established planning commissions) were included in the study area in 1967, which is the base year for the study. Economic and organizational structures in the 14-county area are described and analyzed. A computable model of the area economy is presented. Estimates of the degree of internal interdependence of the area economy are derived as basis for assessing the current status of the area economy and its public financing potentials. The base-year data are used subsequently in the preparation of a projected 1980 inter-industry transactions table. An expanded system of area product and income accounts is presented, also, for both the base year and the target year. These accounts are used in assessing the public economy as part of a total area economy. Water resource development potentials and financing requirements and alternatives are identified in the contest of all public expenditures and outlays in a multi-county area. (Walton-Minnesota)
W74-06846

TECHNIQUES FOR IDENTIFYING AND EVALUATING MARKET AND NONMARKET BENEFITS AND COSTS OF WATER RESOURCE SYSTEMS.
Texas Water Development Board, Austin. Systems Engineering Div.
Available from the National Technical Information Service as PB-231 485 $6.00 in paper copy, $1.45 in microfiche. Completion Report, June 1973. 227 p, 59 fig, 33 tab, 34 ref. OWRR C-3352(3738)(1).

Descriptors: Planning, *Economic impact, Environmental effects, *Texas, Social aspects, Long-term planning, Water allocation, Water resources development, Multi-purpose projects, *Input-output analysis, Resource allocation, Mathematical models, Aquatic environments, Terrestrial habitats, Systems analysis, *Regional analysis, *Cost benefit analysis, *Simulation analysis, *Water policy, *Alternative planning, Water management(Applied), Water demand.
Identifiers: Lake Whitney(Tex), Lake Lewisville(Tex), Lake Belton(Tex).

This research project was designed to provide a set of analytical tools for water resource planners and decision-makers to assist them in measuring and evaluating the market and non-market benefits and costs of water resource systems. The techniques are designed to be sufficiently flexible to analyze all types of water development and management policies. This report describes: (1) the techniques developed to measure the economic, environmental, and social impacts of water policy alternatives, and (2) the application of these techniques to a test case of three existing reservoirs to determine the method's efficacy. The analyses are conducted in three major areas: economic, environmental, and social. In the economic area a regional input-output model, modified to operate in a simulation framework, is used to estimate demand and output in the regional economy subject to primary resource constraints, which include water. Environmental effects of water development and management are estimated by using a simulation model of the aquatic environment. Social impacts of water resource systems are considered by means of selected social indicators and the differences in perceived and measured changes thereto. The three impact areas are tied together in an evaluative framework and a methodology is presented for asking and answering questions about water policy alternatives using the simulation techniques.
W74-06852

BIBLIOGRAPHY OF WATER MANAGEMENT.
Utah State Univ., Logan. Dept. of Agricultural and Irrigation Engineering.
For primary bibliographic entry see Field 3F.
W74-06854

A SIMULATION APPROACH TO RECREATION PLANNING (A CASE OF CHANGING QUALITY),
California Univ., Davis. Dept. of Agricultural Economics.
R. E. Howitt, S. F. Moore, C. V. Moore, and J. H. Snyder.
The Annals of Regional Science, Vol 8, No 1, p 35-50, February, 1974. OWRR B-136-CAL(2).

Descriptors: *Recreation, Economics, *Simulation analysis, Recreation facilities, *California, *Planning, *Projections, Model studies, Alternative planning, Demand.
Identifiers: *Salton Sea(Calif).

Conventional demand based approaches to recreational economics are reviewed and found unsuitable for analyzing the effects of changes of the quality of recreation. An alternative approach using a simulation model is proposed, which allows the use of both quantitative data and subjective input on the qualitative effects. The critical economic variables are found to be fishing recreation visitor days and investment in recreational facilities at the Salton Sea, California. The model results are projected for 20 years and key parameters and assumptions are identified by parametric analysis. These parameters were then subjected to critical interaction by a group of specialists in the area, during a workshop session. Results of the final model are compared to a previous economic study of the region and found to be more pessimistic about the benefits of quality control. Verification of the model is performed by tests of deviation of the predictions of visitor days by the model from the actual visitor days recorded over eight years.
W74-06996

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

A DESIGN AND ECONOMIC EVALUATION OF CATALYTIC OXIDATION OF PHENOLS IN WASTEWATER,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5D.
W74-06516

MAINTENANCE MANAGEMENT SYSTEMS FOR MUNICIPAL WASTEWATER FACILITIES,
Wiley and Wilson, Inc., Lynchburg, Va.
For primary bibliographic entry see Field 5D.
W74-06579

EFFICIENT PRICING FOR URBAN WASTE WATER RENOVATION,
Connecticut Univ., Storrs. Inst. of Water Resources.
For primary bibliographic entry see Field 5D.
W74-06828

U.S. DEEPWATER PORT STUDY, VOL. 2. COMMODITY STUDIES AND PROJECTIONS,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
For primary bibliographic entry see Field 6D.
W74-06863

U.S. DEEPWATER PORT STUDY, VOL 3. PHYSICAL COAST AND PORT CHARACTERISTICS, AND SELECTED DEEPWATER PORT ALTERNATIVES,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
For primary bibliographic entry see Field 6D.
W74-06864

PRODUCTION FUNCTION THEORY AND THE OPTIMAL DESIGN OF WASTE TREATMENT FACILITIES,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
For primary bibliographic entry see Field 6D.
W74-06997

6D. Water Demand

WATER SUPPLY MANAGEMENT ALTERNATIVES FOR RHODE ISLAND,
Analytic Sciences Corp., Reading, Mass.
R. J. Martel.
Available from the National Technical Information Service as PB-231 362, $4.00 in paper copy, $1.45 in microfiche. Final Report No. TR-319, October 1973, 60 p. 13 fig, 6 tab, 24 ref. OWRR C-4260(No 9039)(1). 14-31-0001-9039.

Descriptors: Water resources development, Forecasting, State governments, *Rhode Island, Planning, Water conservation, Water policy, *Water supply, Reservoirs, Groundwater, Economics, Water requirements, *Water demand, *Management, *Alternative planning.
Identifiers: Big River(R.I.), Wood River(R.I.).

Water supply management in Rhode Island has evolved under the traditional public service criterion of meeting the projected requirements for water. Continuation of this policy could exhaust the state's developable fresh water resources in another 40 years. An alternative is for the state to adopt a policy of resource management, under which both supply and demand would be regulated to achieve broader economic and social objectives. The Big-Wood reservoir project provides the state government with an opportunity to implement resource management policies by maintaining control over the development of these reservoirs and the allocation and pricing of their waters. The economic, environmental, and institutional implications of this project are analyzed, and policy options for the state are presented. The technical approach is a systems analysis of policy alternatives. It was concluded that the broader economic, social and environmental implications of water supply development weigh in favor of the state retaining its responsibility for developing and managing the water and related land resources of the Big River and Wood River basins.
W74-06827

AREA FINANCING OF WATER RESOURCE DEVELOPMENT IN WEST MINNESOTA,
Minnesota Univ., St. Paul. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 6B.
W74-06846

U.S. DEEPWATER PORT STUDY, VOL. 2. COMMODITY STUDIES AND PROJECTIONS,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
R. L. Trisko, P. Chevey, J. deRover, J. C. Ulin, and B. Abnert.
Available from the National Technical Information Service as AD-750 091, $12.50 in paper copy, $1.45 in microfiche. Army Engineer Institute for Water Resources, Alexandria, Va., IWR Report 72-8, Vol 2, August 1972. 603 p, 13 fig, 220 tab, 30 ref. DACW 31-71-C-0045.

Descriptors: *Future planning(Projected), *Harbors, *Export, *Import, Human population, Gross National Product, Foreign trade, Oil, Supply, Demand, Transportation, Canada, Steel, Aluminum, Aluminum alloys, Industries, Bituminous coal, Coals, Grains(Crops), Soybeans, Feeds, Foods, Technology, Fertilizers.
Identifiers: *Deepwater ports, *Bulk commodities, Crude petroleum, Petroleum products, Iron ore, Bauxite, Alumina, Meal, Phosphate rock, China, Japan, Western Europe.

The increasing demands on United States deepwater ports handling bulk commodities, specifically petroleum, raw aluminum materials, phosphate rock, bituminous coal, iron ore, and grains, are projected for the years 1980, 1990, and 2000. The determination of the projected demands for the six commodities are based on the population and economic growth of the United States, Canada, Western Europe, and Japan. Demand, internal supply, and imports are projected for the United States consumption of petroleum, aluminum raw materials and iron ore, and the movement of each is traced from its source of origin to its final destination through United States' deepwater ports. Intra-United States movement of these commodities is also examined. Demand, internal supply, and exports of food and feed grains, soy beans, meals, phosphate rock and bituminous coal are also projected and their shipment traced. The sensitivity of each of these projections is discussed relative to changes in technological, economic, and political factors. The potential impact of mainland China's increased activity in the world markets is also evaluated, particularly its prospects for grain import requirements and coking coal exports. (See also W74-06864) (Schroeder-Wisconsin)
W74-06863

U.S. DEEPWATER PORT STUDY, VOL 3. PHYSICAL COAST AND PORT CHARACTERISTICS, AND SELECTED DEEPWATER PORT ALTERNATIVES,
Nathan (Robert R.) Associates, Inc., Washington, D.C.
R. L. Trisko, P. Chevey, J. deRover, J. C. Ulin, and B. Abnert.
Army Engineer Institute for Water Resources, Alexandria, Va. IWR Report 72-8, Vol 3, August 1972. 542 p, 91 fig, 148 tab. DACW 31-71-C-0045.

Descriptors: *Harbors, *Future planning(Projected), *Physical properties, Coasts, Access routes, Depth, Import, Export, Foreign trade, Oil transportation, Steel, Aluminum, Aluminum alloys, Bituminous coal, Coals, Grains(Crops), Soybeans, Foods, Feeds, Fertilizers, Channels, Costs, Pipelines, Ships.
Identifiers: *Deepwater ports, *Bulk commodities, Crude petroleum, Petroleum products, Iron ore, Bauxite, Alumina, Meal, Phosphate rock, Supertankers, Transshipment.

Reconnaissance surveys of United States port facilities, coastal areas, and ports are provided for the north Atlantic coast, including Maine through Virginia, the south Atlantic coast, including North Carolina through the Atlantic coast of Florida, the Gulf coast of Florida through Texas, the south Pacific coast including California, and the north Pacific coast including Oregon and Washington. Embraced in the surveys are general descriptions of the physical characteristics of the coastlines and the major harbors showing water depth, distance contour lines of 60, 90, and 120 feet, and longitudinal cross sections of major channels from the major facilities to a depth of 120 feet. Descriptive information is also provided on docking and commodity handling facilities within the ports, their physical design, and constraining features which might limit the form of future development within major harbors and channels. 1968-69 imports and exports, and 1969 intracoastal transfers data are also provided by port for crude petroleum and petroleum products, iron ore, alumina, bauxite, coal, phosphate rock, food and feed grain, soybeans, and soybean meal. (See also W74-06863) (Schroeder-Wisconsin)
W74-06864

EXPLORING ENERGY CHOICES.
Energy Policy Project, Washington, D.C.
Available from The Energy Policy Project, P O Box 23212, Washington, D.C. 20024, Price $0.75. Ford Foundation Energy Policy Project Preliminary Report, Washington, D.C., 1974. 81 p, 13 fig, 3 tab, 3 append.

Descriptors: *Energy, *Water resources, *Water pollution, *Water demand, Nuclear energy, Thermal powerplants, Water utilization, Oil fields, Coal mines, Electric power, Electric power demand, Planning, Regulation.
Identifiers: *Energy supply and demand.

The gap between domestic energy consumption and domestic production emerged in the 1950's and has grown rapidly since 1970. Three descriptive scenarios of the future are presented to show the range of feasible energy consumption patterns from which the nation can choose. These scenarios differ in their impacts on availability of energy supply, the environment, foreign policy, life styles, and the economy. One scenario is based on the persistence of present growth trends; another is a technical fix solution, which maintains the same growth in energy services, but stresses policies needed to reduce growth in energy use; a zero energy growth scenario would require changes in both life styles and the economy to reach a steady no-growth state. Water scarcity is a major factor limiting the development of coal industries in the West. While there may be adequate water for mining and rehabilitation of many areas, there is not enough water available there for large-scale operations. A pollution problem is acid mine drainage. A potential for oil spills exists in drilling and recovery operations on the Continental Shelf, in transporting Alaskan oil, and in importing oil. Oil shale development also raises serious environmental problems. Large amounts of water would be needed for commercial operations in a region where water resources are limited. Nuclear risks are qualitatively very different from those of fossil fuel systems. Like coal- and oil-fired plants, nuclear plants produce thermal pollution, but in their day-to-day operation they produce no air pollution. (Knapp-USGS)
W74-06879

A SIMULATION APPROACH TO RECREATION PLANNING (A CASE OF CHANGING QUALITY),
California Univ., Davis. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 6B.
W74-06996

PRODUCTION FUNCTION THEORY AND THE OPTIMAL DESIGN OF WASTE TREATMENT FACILITIES,
Krannert Graduate School of Industrial Administration, Lafayette, Ind.
J. R. Marsden, D. E. Pingry, and A. Whinston.
Applied Economics, v 4, p 279-290, 1972. 8 ref. OWRR A-024-IND(2).

Descriptors: *Waste water treatment, *Planning, *Decision making, *Optimization, Activated sludge, Trickling filters, Aeration, *Treatment facilities.
Identifiers: *Production functions, *Cost functions, Non-linear programming.

The theoretical production framework of the current study is compared with that of predecessors. Then the development of theoretical micro-production and cost functions for water treatment plants is considered. Much of the previous work dealing with the development of production functions fail to comply with the concepts set forth by R.W. Shepard. Several papers begin with a hypothetical production functional form which is then fit to some set of empirical data. The assumptions of efficiency and cost-minimization are generally imposed in what are treatises on the technological level currently employed. An alternative approach is presented which obviates the need for the above assumptions - an approach which is more appropriate for planning purposes than the conventional descriptive procedures. The importance and usefulness of efficient production processes is emphasized. A production function is not related to what people do, but rather is a function relating inputs to outputs summarizing efficient production methods. (Wiersma-Indiana)
W74-06997

6E. Water Law and Institutions

EMERGENCY PLANNING FOR MUNICIPAL WASTEWATER TREATMENT FACILITIES,
Wiley and Wilson, Inc., Lynchburg, Va.
For primary bibliographic entry see Field 5D.
W74-06577

ESTABLISHMENT OF MEAN HIGH WATER LINES IN FLORIDA LAKES,
Florida Univ., Gainesville. Water Resources Research Center.
For primary bibliographic entry see Field 2H.
W74-06610

A CHART OF NEW YORK WATER LAW,
Cornell Univ., Ithaca, N.Y. Dept. of Natural Resources.
R. Kasvinsky, and J. B. Bugliari.
Available from the National Technical Information Service as PB-231 373, $4.00 in paper copy, $1.45 in microfiche. A.E. Ext. 598, Dept. of Agricultural Economics, Cornell University, Ithaca, N.Y., Technical Report 32, October 1971. OWRR A-027-NY(1). 14-01-0001-1852.

Descriptors: *New York, *Water law, *Water rights, *Charts, *Riparian rights, Riparian waters, Governments, Groundwater, Surface waters, Percolating water.

The law affecting private water rights in New York State is summarized briefly in the form of a chart. The chart divides the water-affecting law via distinctions concerning the actual nature of the water involved, i.e., water flowing in a defined channel (watercourses - surface and underground streams and lakes) and water not flowing in a defined channel (diffused surface water, percolating underground water). Discussed in a substantial introduction to the chart are the two sources of New York State Water Law, the common law and statutory law; considered also is the limitation of Government removal of water rights for public purposes from private property owners. The material provided in the chart attempts to be as thorough as possible, but it is not absolutely complete or definitive owing to the unstable, changing nature of the law in this area. Many nuances and exceptions have been excluded. The chart represents only a general guide and should be substituted for professional legal counsel in case of a legal controversy. (Bell-Cornell)
W74-06614

THE ENVIRONMENTAL IMPULSE AND ITS COMPETITORS: ATTITUDES, INTERESTS, AND INSTITUTIONS AT LAKE TAHOE,
California Univ., Davis. Dept. of Political Science.
E. Costantini, and K. Hanf.
Available from NTIS as PB-231 487 $4.00 microfiche $1.45. Institute of Governmental Affairs Research Report No. 29, October 1973, 85 p, 11 tab, 4 ref, (California Water Resources Center Project UCAL-WRC-W-299), OWRR-A-037-CAL(3).

Descriptors: *California, *Environmental effects, *Decision making, Constraints, *Political constraints, *Institutions, Psychological aspects, Attitudes, Social values.
Identifiers: *Lake Tahoe(Calif).

Inevitably, the question of what constitutes unacceptable environmental conditions is a political one: Environmental policy cannot be an irresistible, simple, unchallenged response to empirical or scientific fact alone. No matter how weighty the evidence of degradation may be, the environmen-

tal impulse inevitably competing, perhaps stronger, impulses. As a consequence, what constitutes unacceptable environmental conditions and what to do about them are political questions, for it is in the political process that disagreement over significant social values and conflicting interests finds expression and seeks some form of resolution. Two central ingredients of that process are considered: First, the attitudes and backgrounds of persons critically affecting environmental decision-making in the Tahoe Basin, and second, the framework of political institutions within which decisions regarding the Basin are made. In particular, the extent to which these institutions have been responsive to the values of environmental quality, is examined. The objective is to explore the relationships between political institutions and institution building at Tahoe on the one hand, and the environmental impulse and its competitors on the other. (Snyder-California)
W74-06843

INTERGOVERNMENTAL RELATIONS AS SEEN BY FLORIDA STATE LEGISLATORS: LAND USE AND WATER RESOURCE PROBLEMS,
Florida Atlantic Univ., Boca Raton.
For primary bibliographic entry see Field 6B.
W74-06845

OHIO RIVER BASIN COMMISSION ANNUAL REPORT, FISCAL YEAR ENDING JUNE 30, 1972.
Ohio River Basin Commission, Cincinnati.
Available from NTIS, Springfield, Va. 22151 as PB-221 029, $3.00 in printed copy; $1.45 in microfiche. Report to the President through Water Resources Council, 1972. 17 p.

Descriptors: *Ohio River, *Planning, *River basin commissions, River basin development.
Identifiers: *Ohio River Basin Commission.

The Ohio River Basin Commission Annual Report is presented for Fiscal Year 1972. Initial planning efforts undertaken during the Commission's first full year of operation are discussed, and included adoption of the Ohio River Basin Comprehensive Survey Report as the Level A Framework Plan for the development of ORBC's Comprehensive Coordinated Joint Plan (CCJP). (Knapp-USGS)
W74-06918

PROCEDINGS NINTH BIENNIAL CONFERENCE ON GROUND WATER.
For primary bibliographic entry see Field 5B.
W74-06942

THE FEDERAL ROLE AND LEGISLATIVE TRENDS IN CONTROL OF GROUND WATER QUALITY,
Environmental Protection Agency, San Francisco, Calif. Region IX.
For primary bibliographic entry see Field 5G.
W74-06952

CURRENT STATE BOARD ACTIVITIES IN GROUND WATER QUALITY MANAGEMENT,
California State Water Resources Control Board, Scramento.
For primary bibliographic entry see Field 5G.
W74-06953

IMPACT OF WATER POLLUTION CONTROL LEGISLATION ON MEETING FUTURE WATER NEEDS IN CALIFORNIA,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5G.
W74-06954

GROUND WATER POLLUTION--FROM THE WASTE DISCHARGER'S VIEWPOINT,
Gilbert (J.B.) and Associates, Sacramento, Calif.
For primary bibliographic entry see Field 5G.
W74-06955

ENVIRONMENTAL QUALITY: AS AN OBJECTIVE OF GROUND WATER MANAGEMENT,
California State Dept. of Water Resources, Sacramento.
For primary bibliographic entry see Field 5B.
W74-06956

THE NATIONAL ENVIRONMENTAL POLICY ACT AND THE LICENSING PROCESS: ENVIRONMENTALIST MAGNA CARTA OR AGENCY COUP DE GRACE,
For primary bibliographic entry see Field 5G.
W74-06963

THE LAW TO GOVERN DEEPSEA MINING UNTIL SUPERSEDED BY INTERNATIONAL AGREEMENT,
J. G. Laylin.
San Diego Law Review, Vol 10, No 3, p 433-445, May 1973. 15 ref.

Descriptors: *Resource allocation, *Resource development, *Mining engineering, *Engineering geology, *Ownership of beds, Continental shelf, Marine geology, Law of the sea, Oceans, Jurisdiction, Legislation.
Identifiers: Deepsea mining, Seabed.

There presently is no international law limiting freedom to recover mineral resources of the seabed beyond coastal state jurisdiction, nor is there any United States statutory or common law limitations. Pending the adoption of an international regime under the multi-lateral convention that the United Nations Seabed Committee is seeking to bring about, the United States can, by legislation, regulate deep seabed mining by all of its citizens and companies to promote conservation and orderly development of hard mineral resources on the deep seabed. Such legislative regulation is advocated, since the prospects for an international pact in the near future are dim. It is desirable that states having the capability to carry on mining put restraints upon themselves that encourage activity but do not permit assertion of rights beyond those necessary to assure progress, equity and order in ocean development. Legislation now before Congress provides for licensing of American mining activities beyond the continental shelf. Such legislation should include, a provision for reciprocity with other nations enacting similar legislation. (Flowers-Florida)
W74-06964

RECENT DEVELOPMENTS IN THE LAW OF THE SEA IV: A SYNOPSIS,
G. D. Greenblatt, J. R. Miller, and A. J. Waldchen.
San Diego Law Review, Vol 10, No 3, p 559-598, May 1973. 101 ref.

Descriptors: *Fish conservation, *Commercial fishing, *Foreign waters, *Law of the sea, International waters, Judicial decisions, Oil exploration, Water resources, Water resources development, Fish harvest, Pacific Ocean, Boundary disputes, Oil industry, Jurisdiction, Oceans, Atlantic Ocaen.
Identifiers: *Territorial waters, *Seabed resources, *Sovereignty, *International agreements, *Coastal waters, Comparative law.

A synopsis is presented of important events pertaining to the law of the sea during the last two years. The President's message to Congress is discussed along with the internationally sanctioned reduction in whale kill, the salmon fishing curb in Canada, and other fisheries acts for control, conservation, and research and development. Many fishing agreements are recounted such as those between Peru and the Soviet Union, Chile and the Soviet Union, and Japan and the United States. Legislation was also passed to develop tuna resources. This was spurred by Ecuadorian and Peruvian seizures for alleged invasions of their claimed two hundred mile territorial limit. An Alaskan fishing law was upheld in the face of a Constitutional attack. The law prohibited the use of a power drum to bring in cast nets in Alaskan territorial waters. The court found a compelling state interest in the conservation of salmon. Seabed resources are also discussed with particular attention to new oil leases and exploration. Attempts to protect shipping by avoiding incidents on the high seas as well as extensions of sovereignty by extending territorial waters are also discussed. (Sperling-Florida)
W74-06965

SEAMOUNTS AND GUYOTS: A UNIQUE RESOURCE,
S.K. Eaton, Jr., and J. Judy.
San Diego Law Review, Vol 10, No 3, p 599-637, May 1973. 129 ref.

Descriptors: *Geology, *Law of the sea, *International waters, *Marine fishery, *Engineering geology, Foreign waters, Terrain analysis, Research and development, Weather forecasting, Fish handling facilities, Commercial fishing, Communication, Marine geology, Oceans.
Identifiers: *Seamounts, *Guyots, *Sovereignty, *Seabed resources, International agreements, International regime.

The potential of the seabed as a source of natural resources is discussed. Recent advances in technology have made possible exploration of the deep seabed. This exploration has fostered concern for the establishment of a legal regime for regulation of the ocean floor. The necessity for such regulation is due to the fact that existing International Law principles do not or cannot apply to the seabed beyond national jurisdiction. The 1973 Conference on the Law of the Sea will attempt the formulization and adoption of an integrated plan, to exploit and develop ocean resources for the benefit of mankind as a whole. Seamounts and guyots, their legal status under international law, and the possible uses to which these phenomena may be put are described. Discussed as possible uses are: military utilization, mineral resource development, transportation, fishing, communications, weather forecasting, and expansion of territory. Alternate proposals to the formation of an international regime are also discussed. (Sperling-Florida)
W74-06966

COASTAL WETLANDS IN NEW ENGLAND,
For primary bibliographic entry see Field 5G.
W74-06967

WHATEVER HAPPENED TO TVA,
G. Young.
National Geographic, Vol 143, p 831-863, June 1973. 1 map, 10 photo.

Descriptors: *Tennessee Valley Authority, *Tennessee River, *Management, *Nuclear energy, *Environmental control, Environmental effects, Tennessee, Strip mines, Coal, Water resources development, Recreation, Multiple purpose projects, Mussels, Fertilizers, Hydroelectric plants.

The entire countryside surrounding the Tennessee Valley Authority (TVA) project is examined, seeing what it has done and what it has meant to the people. A short history of TVA is presented. The cries of socialism during the 1930's and the Manhattan Project and the atom bomb of the 1940's are described. Throughout both of these periods as well as now, the purpose of the program is to generally upgrade life surrounding the area. The

project now is concerned with peaceful uses of the atom in nuclear power, and environmental programs concerning land-management and water-quality studies. One such program especially noted is the Rapid Adjustment Farming Program which helps farmers specialize in the crops and livestock that best fit their needs and land. The manner in which TVA has helped to better utilize the surrounding recreational facilities and research on the development of fertilizer are described. As TVA represents the largest coal consumer in the United States, the new problem is the environmentalists and their assertion that TVA is doing far too little to prevent strip miners from leaving ugly gashes on the land. While admitting this to some extent, TVA directors say they do realize the problems and recently have begun to do more about it. (Sutton-Florida)
W74-06968

WILL MUNICIPAL SEWAGE CONTINUE TO THREATEN PRIMARY WATER-CONTACT RECREATION: AN APPRAISAL OF THE 1972 WATER POLLUTION CONTROL ACT,
For primary bibliographic entry see Field 5G.
W74-06969

THREE-YEAR EVOLUTION,
For primary bibliographic entry see Field 6G.
W74-06970

CONSERVATIONISTS GO TO COURT--PART 1,
For primary bibliographic entry see Field 4D.
W74-06971

DRAINAGE DISTRICTS.
N.C. Gen. Stat., sec. 159-69, p 227-228 (1973).

Descriptors: *North Carolina, *Legislation, *Surveying, *Mapping, *Drainage districts, State governments, Adoption of practices, Drainage patterns, Irrigation canals, Irrigation ditches, Bench marks, Data collections, Terrain analysis, Evaluation, Laterals, Outlets, Water management(Applied), Land management, Watercourses, Ditch, Channel, Administration, Engineering structures, Regulation.
Identifiers: *Administrative regulations.

This statute provides for the survey of drainage districts. Each drain, lateral drain, ditch, and levy shall be marked on the ground. Also, the course and distance of each ditch is to be mapped. If an old watercourse, ditch, or channel is being widened, deepened, or straightened, the cross-section will be accurately determined. The board of viewers will consider the effect of the proposed improvements upon the habitat of fish and wildlife. The need for and feasibility of structures to control the flow of water, to impound or store water, and to provide areas for the conservation and replacement of fish and wildlife habitat will be considered by the board. If structures are to be recommended, the report will include specifications, the location of the structure, and the estimated cost. The report will also set forth the areas of land needed for construction and maintenance of the canals and drainage system and structures to control, impound, or store water as well as fish replacement and will also include on whose land such areas are located, and the area of land necessary to be acquired from each landowner. (Sperling-Florida)
W74-06972

GROUNDWATER USE ACT OF 1969.
S.C. Code Ann., secs. 70-31 through 70-42 (1969).

Descriptors: *South Carolina, *Legislation, *Groundwater, Consumptive use, Aquifer, Water, Water law, Water resources, Water utilization, Legal aspects, Regulation, Permit, Non-consumptive use, Penalties(Legal), Underground streams, Subsurface waters, Water table, Water sources.
Identifiers: Injunctive relief.

The water resources of the state of South Carolina shall be put to beneficial use to the fullest extent possible, subject to reasonable regulation in order to conserve and develop these resources. The South Carolina Water Resources Planning and Coordinating Commission is authorized to develop capacity use areas in any area where aggregate uses exceed or threaten to impair the renewal or replenishment of waters in that area. The Commission shall then prepare regulations governing the use of groundwaters in the area to prevent untimely withdrawals and saltwater intrusion as well as provisions governing well depth and spacing controls. In such areas no person shall withdraw in excess of one hundred thousand gallons per day without a permit from the Commission. Penalties for violations of provisions of this statute are contained therein, and the Commission is empowered to obtain injunctive relief when necessary. (Ritchie-Florida)
W74-06973

DIVISION OF WATER: POWERS AND DUTIES.
Ohio Rev. Code Ann. secs 1521.03 (Supp. 1972).

Descriptors: *Ohio, *Groundwater recharge, *Water resources, Water resources development, Watershed management, Flood control, Drainage systems, Flood protection, Flood proofing, Water pollution control, Legislation, Regulation, Conservation, Construction, Research and development, Governments, Administration, Administrative agencies.
Identifiers: *Administrative regulations.

The division of water shall play an advisory role in any watershed district, soil conservation district, county, municipal corporation, or other agency of the state of Ohio in the planning of works for ground water recharge and water conservation practices. This division has authority to inventory water and related resources in each drainage basin in the state, and to formulate a plan which recognizes the variety of uses to which water may be put and the need for its retention and control. It can also investigate and study all factors relating to floods and flood control with particular attention to maintenance of the efficiency of the channels of rivers, streams, and watercourses as a means of carrying off flood waters. The division's aid can also be enlisted in planning and constructing flood control works. (Sperling-Florida)
W74-06974

POWERS OF THE WATER POLLUTION CONTROL BOARD: POWERS OF DIRECTOR OF ENVIRONMENTAL PROTECTION.
Ohio Rev. Code Ann. sec 6111.03 (Supp. 1972).

Descriptors: *Ohio, *Waste disposal, *Water pollution control, Legislation, Water pollution, Pollution abatement, Water quality control, Standards, Regulation, Wastes, Sewage disposal, Permits, Construction, Governments, Administrative agencies, Supervisory control(Power).
Identifiers: *Administrative regulations, Injunctive relief, Licenses.

The director of environmental protection has power to develop plans and programs for the prevention, control, and abatement of new or existing pollution of the waters of the state of Ohio. The director also has the power to encourage and participate in investigations related to water pollution. He can require the construction of new disposal systems as well as modification of existing systems. The director can issue, revoke, or deny permits and specify conditions for the discharge of sewage, industrial waste, or other wastes. The director can also institute proceedings to compel compliance with his orders. (Sperling-Florida)
W74-06975

INDUSTRIAL DEVELOPMENT--POLLUTION.
Mich. Comp. Laws Ann., sec. 125.1253a (Supp. 1973), as amended, act 7, sec. 1 (1973), Mich. Pub. Acts.

Descriptors: *Michigan, *Air pollution, *Water pollution, *Legislation, *Water law, *Water pollution abatement, *Water pollution control, *Financing, Cities, Public utilities, Industries, Industrial wastes, Water pollution sources, Equipment, Abatement, Public health, Pollution abatement, Air, Water.

To protect the public health, safety and welfare of the residents of Michigan, there is a continuing need for water and air pollution control for industries and public utilities. It is thus necessary that these industries and public utilities acquire, construct, refurbish, enlarge and repair the operation and maintenance of adequate and proper equipment to control air and water pollution. This act confers the authority and power to municipalities to acquire, construct, improve, enlarge and maintain such necessary facilities, to issue revenue bonds to finance such acquisitions and improvements, to enter into lease or lease purchase agreements regarding such equipment and to sell any such equipment. The interest of the municipality in the water and air pollution control equipment may be made subject to a mortgage, lien, security interest or encumbrance given by a public utility from which the municipality acquired its interest. (Silber-Florida)
W74-06976

CLEANING AGENTS.
Mich. Comp. Laws Ann. secs. 323.231-323.236 (Supp. 1973).

Descriptors: *Water pollution, *Legislation, *Michigan, Detergents, Phosphorus, Legislation, Water resources, Algae, Weeds, Aquatic week control, Slime, Environmental effects.

The content of cleaning agents is restricted in order to protect water quality by preventing and controlling growth of algae, weeds and slimes. Cleaning agents which contain phosphorus in any form in excess of 8.7% by weight are prohibited. The Michigan water resources commission promulgates rules for this clean agents act. The rules may further provide restriction of nutrient content and other contents of cleaning agents and water conditioners, to prevent unlawful pollution and control nuisance growths of algae, weeds and slimes which are or may become injurious to other lawful water uses. A person is prohibited from selling detergents or cleaning compounds containing any substance other than phosphorous that may cause unlawful pollution of the waters when discharged thereto. The water resources commission shall enforce this act and seek court enforcement of its orders. (Daniels-Florida)
W74-06977

SEWER CONSTRUCTION.
Mich. Comp. Laws Ann. secs. 323.412 (Supp. 1973).

Descriptors: *Legislation, *Michigan, Construction, Sewerage, Structures, *Water pollution control, Economics, Budgeting, Legal aspects, Sewage treatment, Sewage.

Procedures are outlined for applications for collecting sewer construction grants. The construction grants projects are to be certified by the Director of the Michigan Department of Administration and the State Treasurer. The Michigan Water Resources Commission shall report to the Legislature the collecting sewer projects eligible for grants, the points and priorities assigned to them pursuant to this Act and a list of projects that are recommended to be funded. (Daniels-Florida)
W74-06978

SEWAGE TREATMENT FACILITIES, STATE GRANTS.
Mich. Comp. Laws Ann. secs. 323.112, 323.113, 323.113a, 323.125, 323.126 (Supp. 1973).

Descriptors: *Water pollution control, *Sewage treatment, Construction, *Michigan, Environmental effects, Legislation, Grants, Projects, Water resources development, Governmental interrelations, Economics, Budgeting.

The Michigan state sewer construction fund is transferred to the water pollution fund. Disbursements from the water pollution control fund are provided for specific eligible treatment works projects. The eligible projects for a federal grant can receive a state grant up to 25% of construction costs for the treatment project. Disbursements from the fund shall be made by the Director of the Department of Administration and the state treasurer. Grants and advances to local agencies shall be funded from the State Water Pollution Control Fund for treatment works projects in descending order of their priority as established by the Water Resources Commission until all projects which have been approved have been funded. (Daniels-Florida)
W74-06979

SEWAGE COLLECTION FACILITIES.
Mich Comp Laws Ann, sec 123.192, 123.193 (Supp 1973).

Descriptors: *Michigan, *Sewerage, *Sewage disposal, *Wastes, *Domestic wastes, Sanitary engineering, Sewage treatment, Water pollution sources, Pipelines, Sewage sludge, Wastewater disposal, Sewage effluents, Legislation, State governments.

Section 123.192 provides that any property from which sanitary sewage emanates must be connected to a public sewage collection facility within eighteen months of the occurrence of the last of the following events: (1) availability of a public facility; (2) improvement of the property so as to become property from which sewage emanates; (3) this act's effective date. A new addition to the statute gives municipalities the power to require connection in a shorter time, but not less than six months. Section 123.193 provides that if any property is not connected within the time periods set out above, the owner or operator of the nearest available facility shall require connection forthwith, by written demand mailed to the record owner of the property and posted beside an entrance to the property. The demand must give the location of the nearest collection facility and advise the owner of the other requirements of the statute. (Flowers-Florida)
W74-06980

REGIONAL WATER AND SEWER DISTRICTS: RIGHTS, POWERS AND DUTIES.
Ohio Rev. Code Ann. sec. 6119.06 (Supp. 1972).

Descriptors: *Ohio, *Flow measurement, *Flow rates, Flow augmentation, Flow profiles, Public health, Planning, Natural resources, Water pollution control, Regulation, Conservation, Construction, Administrative agencies, State governments, Sewage districts, Water districts.
Identifiers: *Administrative regulations.

The regional water and sewer districts may make loans or grants to political subdivisions for the construction of water resource projects. They may also acquire, reconstruct, enlarge, equip, maintain, repair, or rent water resource projects. The districts may adopt regulations to protect augmented flow in waters of the state of Ohio from depletion so it will be available for use by the public. It can change or remove any building or structure to carry out its objectives. The owner of any premises in the district can be required to connect his premises to a water resource project as to prevent or abate pollution or protect the health and property of persons in the district. (Sperling-Florida)
W74-06981

WATER POLLUTION--SUMMER INTERN PROGRAM.
Ch. 79 (1973) Laws of New Jersey, to be enacted as, N.J. Stat. Ann., ch. 13:1D-20 to 13:1D-28.

Descriptors: *New Jersey, *Legislation, *Water pollution, *Financing, *Programs, *Pollution abatement, Budgeting, Surveys, Data collections, Measurement, Monitoring, Streams.

The New Jersey legislature has declared as a state goal the elimination of all pollution and polluting substances from the state's waters. The legislature has thus appropriated $100,000 to the Department of Environmental Protection for the purpose of employing college students during the summer months to aid in cleaning those waters. Summer interns will be assigned to such projects as making surveys of all places where polluting materials are entering streams, providing water sampling and monitoring activities, desnagging and removing debris, and performing any other projects designed to carry out the intent of this act. Any New Jersey resident enrolled full-time in any college or university may apply as an intern provided he has completed his freshman year of schooling but has not completed his final year of college. The program shall be administered by the Director of the Division of Water Resources in the Department of Environmental Protection. (Ritchie-Florida)
W74-06982

DRAINAGE.
N.Y. Sess. Laws, Ch. 664, secs. 15-1901 through 15-1983 (McKinney 1972).

Descriptors: *New York, *Drainage, *Drainage districts, *Agriculture, Legislation, Structures, Construction, Public health, Petitions, Projects, Agricultural runoff, Financing.
Identifiers: Drainage systems.

This statute gives the New York (drainage improvement) department powers and duties herein described with respect to drainage. The purpose is to provide for the drainage of agricultural land so that it can be more productive in order to benefit the public health, safety and welfare. The statute sets up drainage improvement districts and associations which represent the interests of its members in drainage matters. To carry out surveys and examinations, the department may enter upon any lands, structures and waters as necessary. Procedures have been established for petitions, district formation, enhancements, authorization for construction, financing of projects, assessment and collection of cost, and for discontinuance of the districts. All work is to be done by contract and the department should prepare the contracts, plans and specifications for doing such construction and furnishing the necessary materials. The care, operation and maintenance of the drainage works is subject to the control and supervision of the department. (Daniels-Florida)
W74-06983

RIVER V. RICHMOND METROPOLITAN AUTHORITY.
359 F. Supp. 611-643 (E.D. Va. 1973).

Descriptors: *Judicial decisions, *Rivers and Harbors Act, *Navigable waters, *Environmental effects, *Highways, Construction, Legislation, *Virginia, Environment, Permits, Drainage, Navigation, Transportation, Canals, Roads, Governments, Social aspects, Natural resources.
Identifiers: Injunctive relief, National Environmental Policy Act(NEPA), Navigation obstructions, *Richmond(Va).

A nonprofit corporation brought an action against state and federal authorities for injunctive relief with respect to proposed construction of a limited access expressway in the downtown area of Richmond, Virginia. Plaintiffs in one count alleged that because the proposed expressway requires encroachment upon navigable waters, the defendants must apply, pursuant to the Rivers and Harbors Act of 1899, to the Corps of Engineers for a construction permit. The court did not determine the desirability of the expressway but rather the applicable law. The protection of the environment is of utmost importance and the decision to protect it is up to Congress. The court held that the river and canal which was drained and filled did not constitute navigable waters for the purpose of determining whether the proposed construction would be violative of the sections of the rivers and harbors act, relating to approval for construction of any bridge or causeway over navigable water. Summary judgment motion for defendant was granted. (Daniels-Florida)
W74-06984

LEGAL IMPEDIMENTS TO THE USE OF INTERSTATE AGREEMENTS IN COORDINATED FISHERIES MANAGEMENT PROGRAMS: STATES IN THE N.M.F.S. SOUTHEAST REGION,
Louisiana State Univ., Baton Rouge. Law School.
H. G. Knight, and T. V. Jackson.
September 28, 1973. 120 p, 140 ref.

Descriptors: *Southeast U.S., *Research and development, *State governments, *Coordination, Adoption of practices, Legislation, Fish conservation, Fish establishment, Fish management, Commercial fishing, Estuarine fisheries, Saline water, Fish, Water resources development, Coasts, Judicial decisions, Governments, Political aspects, Interstate commissions, Governmental interrelations.
Identifiers: Coastal zone management.

The purpose is to identify and analyze existing impediments to coordinated interstate fisheries management agreements among coastal states in the Southeastern United States. Another purpose is to identify and analyze alternative methods for developing a system of coordinated fisheries management among those states. This study is limited exclusively to marine fisheries and does not cover fresh water fishery management problems; however, much of the study is equally applicable in fresh water fisheries. The coastal fisheries management systems of each of the eight states in the Southeast are included. Discussions were conducted with each of the resource managers and attorneys of the states to gain a better understanding of the state's coastal fishery management system and seek new ideas and comments relating to the use of interstate agreements in coastal fisheries management programs. Research was also directed to the broader implications of the study such as the general use of interstate agreements and the requirement of Congressional consent to interstate agreements. (Sperling-Florida)
W74-06991

LEGAL AND ADMINISTRATIVE ASPECTS OF AN AQUACULTURE POLICY FOR HAWAII, AN ASSESSMENT,
Hawaii State Dept. of Planning and Economic Development, Honolulu.
G. M. Trimble.
Available from the National Technical Information Service as PB-220 186. Western Interstate Commission for Higher Education report, December, 1972. 61 p, 1 tab.

Descriptors: *Hawaii, *Aquiculture, Agriculture, Effluents, Laboratory tests, Fisheries, Commercial fishing, Fish management, Research and development, Water rights, Water quality, Water quality standards, Coasts.

This assessment is the first of a series to be undertaken to provide recommendations for Hawaii decision makers. Findings are based on project results and recommendations are based on literature searchers, interviews, questionnaires and a one day structured Assessment Workshop. The project resulted in studies of ancient Hawaiian konohiki fishing rights, kuleana water rights, and fish pond cultures of mullet and milk fish, showing that they are compatible with the development of modern aquaculture in Hawaii. Most of the forthcoming needs of commercial aquaculture development in Hawaii can be adequately handled by administrative or regulatory action. In the near future aquaculture in Hawaii is most likely to occur on agricultural lands or at inland locations where no effluent discharge occurs. Hawaii's present institutional structure supports laboratory research and commercial operations, and it is unlikely that incentives to commercial enterprise to undertake long term research and development in aquaculture will succeed. There is a need for commercial identification and quality standards to insure high-quality aquaculture products, thereby enhancing customer acceptance. Included is a bibliography containing thirty-eight sources. (Sears-Florida)
W74-06992

RATIFICATION OF PROPOSED CONVENTION ON THE PREVENTION OF MARINE POLLUTION BY DUMPING OF WASTES AND OTHER MATTER (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of State, Washington, D.C.
Available from National Technical Information Service, U.S. Dept of Commerce, Springfield, Va, as EIS-AA-73-0177-F. PC $10.00, microfiche $1.45. January 1973. 160 p, 2 tab.

Descriptors: *United States, *Environmental effects, *International law, *International waters, *Governmental interrelations, Federal government, Legislation, Political aspects, Foreign waters, Law of the sea, Commercial fishing, Water pollution, Oceans, Ocean circulation, Coasts, Pollutants.
Identifiers: *Environmental Impact Statements, *Coastal waters.

The action under consideration is the ratification by the United States of a convention developed at a governmental Conference. It would prohibit all deliberate disposal at sea from vessels and aircraft of certain dangerous substances, and require permits for the dumping of other substances in accordance with detailed criteria. All coastal states bordering upon the high seas would be particularly affected by the action under consideration. The convention would hopefully stimulate other nations to abide by procedures and standards for ocean dumping that are in general harmony with those contemplated in the U.S. Marine Protection, Research and Sanctuaries Act of 1972. Alternatives include reliance solely on domestic laws, expansion of the subject convention to cover other forms of marine pollution, and U.S. participation in a regional rather than a global ocean dumping convention. (Conko-Florida)
W74-06994

6G. Ecologic Impact Of Water Development

GEOGRAPHY OF WATERFOWL RESOURCES OF THE SOVIET UNION. CONDITION OF RESERVES.
For primary bibliographic entry see Field 6B.
W74-06559

ASSESSMENT OF SOUTHERN CALIFORNIA ENVIRONMENT FROM ERTS-1,
California Univ., Riverside. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W74-06685

FINAL ENVIRONMENTAL STATEMENT RELATED TO THE PROPOSED ALVIN W. VOGTLE NUCLEAR PLANT UNITS 1, 2, 3, AND 4.
Directorate of Licensing (AEC), Washington, D. C.
For primary bibliographic entry see Field 5B.
W74-06821

THE ENVIRONMENTAL IMPULSE AND ITS COMPETITORS: ATTITUDES, INTERESTS, AND INSTITUTIONS AT LAKE TAHOE,
California Univ., Davis. Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W74-06843

THREE-YEAR EVOLUTION,
C. G. Ash.
Water Spectrum, Vol 5, No 4, p 28-35, 1973. 4 photo, 2 fig, 1 chart.

Descriptors: *Environmental effects, *Environmental engineering, *Balance of nature, *Federal project policy, *Inter-Agency Comm. on Water Resources, *Water resources development, Feasibility studies, Project planning, Federal government, Administrative agencies, Project purposes, Water policy, Water conservation, Ecology, Land conservation, Inter-agency cooperation.
Identifiers: *National Environmental Policy Act, *Environmental impact statement.

The environmental impact statements required by the National Environmental Policy Act (NEPA) and the changes which have occurred during the past three years are described. The evolution reflects new approaches to resources and their use and new concepts in planning. In retrospect, there appear to be three distinct phases which the implementation of NEPA has gone through. The first phase, or period of interpretation, was characterized by much speculation but little action. In the second phase, the procedural phase, the emphasis was placed on adhering to the letter of the law. The third phase is termed the integrated planning phase. Under this third stage concept, adherence to NEPA for a particular project requires the examination of a least three separate Corps of Engineers documents. Statements prepared recently generally meet the full disclosure concepts of NEPA and relate the activities involved to environmental impacts at various stages of project completion. The use of matrix factors in determining environmental effects and the disadvantages of this method are described. The procedure in both the pre- and post-authorization stages is outlined. (Sutton-Florida)
W74-06970

CONSERVATIONISTS GO TO COURT--PART 1,
For primary bibliographic entry see Field 4D.
W74-06971

POWERS OF THE WATER POLLUTION CONTROL BOARD: POWERS OF DIRECTOR OF ENVIRONMENTAL PROTECTION.
For primary bibliographic entry see Field 6E.
W74-06975

CHOCTAWHATCHEE RIVER AND HOLMES CREEK, FLORIDA, PERMIT APPLICATION BY FLORIDA GAME AND FRESH WATER FISH COMMISSION (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Mobile, Ala.
For primary bibliographic entry see Field 4A.
W74-06985

WOODCOCK CREEK LAKE, FRENCH CREEK BASIN, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
For primary bibliographic entry see Field 8A.
W74-06986

PATTERSON WATERSHED PROJECT, STANISLAUS COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Berkeley, Calif.
For primary bibliographic entry see Field 4A.
W74-06987

HURRICANE CREEK WATERSHED PROJECT, HUMPHREYS AND DICKSON COUNTIES, TENNESSEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4D.
W74-06988

LOWER KLAMATH RIVER FLOOD CONTROL PROJECT, DEL NORTE COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATMENT).
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W74-06989

NUTWOOD WATERSHED, ILLINOIS (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Washington, D. C.
For primary bibliographic entry see Field 4A.
W74-06990

PROPOSAL FOR OKLAWAHA RIVER, OCALA NATIONAL FOREST, FLORIDA, (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Forest Service (USDA), Washington, D.C.
For primary bibliographic entry see Field 4A.
W74-06993

RATIFICATION OF PROPOSED CONVENTION ON THE PREVENTION OF MARINE POLLUTION BY DUMPING OF WASTES AND OTHER MATTER (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Department of State, Washington, D.C.
For primary bibliographic entry see Field 6E.
W74-06994

COOPERATIVE GULF OF MEXICO ESTUARINE INVENTORY AND STUDY, FLORIDA: PHASE 1 AREA DESCRIPTION,
National Marine Fisheries Service, St. Petersburg Beach, Fla. Gulf Coast Fisheries Center.
For primary bibliographic entry see Field 2L.
W74-06995

URBANIZATION AND HUMAN HEALTH,
For primary bibliographic entry see Field 5G.
W74-07017

ENERGY FLOWS IN THE BIOSPHERE: THE IMPACT OF MAN,
Australian National Univ., Canberra. Research School of Biological Sciences.
For primary bibliographic entry see Field 2B.
W74-07043

7. RESOURCES DATA

7A. Network Design

QUANTITATIVE METHODS FOR PRELIMINARY DESIGN OF WATER QUALITY SURVEILLANCE SYSTEMS,
Raytheon Co., Portsmouth, R. I. Oceanographic and Environmental Services.
For primary bibliographic entry see Field 5A.
W74-06885

7B. Data Acquition

A SIMPLE AUTOMATIC SOIL PERCOLATOR,
Hawaii Univ., Honolulu.
K. P. Goswami, and K. P. Green.
Soil Biol Biochem. Vol 3, No 4, p 389-391. 1971, Illus.
Identifiers: *Automatic equipment, *Soil percolator, Apparatus.

The apparatus differs from those previously described in the manner in which small volumes of solution are introduced into the lift tube which delivers solution to the tops of a soil column. An inverted glass 'y-joint' submerged in the reservoir solution allows alternate increments of air and solution to proceed up the lift tube without adjustment of tubing and liquid levels.--Copyright 1973, Biological Abstracts, Inc.
W74-06531

A LARGE UNDISTURBED, WEIGHING LYSIMETER FOR GRASSLAND STUDIES,
Wyoming Univ., Laramie. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.
W74-06581

CARTOGRAPHIC QUALITY OF ERTS-1 IMAGES,
Georgia Univ., Athens.
For primary bibliographic entry see Field 7C.
W74-06620

PROGRESS IN CARTOGRAPHY, EROS PROGRAM,
Geological Survey, McLean, Va.
For primary bibliographic entry see Field 7C.
W74-06621

ATMOSPHERIC EFFECTS IN ERTS-1 DATA, AND ADVANCED INFORMATION EXTRACTION TECHNIQUES,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 7C.
W74-06646

DETERMINATION OF AEROSOL CONTENT IN THE ATMOSPHERE,
Science Applications, Inc., La Jolla, Calif.
For primary bibliographic entry see Field 7C.
W74-06647

A TECHNIQUE FOR CORRECTING ERTS DATA FOR SOLAR AND ATMOSPHERIC EFFECTS,
Bendix Aerospace Systems Div. Ann Arbo, Mich.
For primary bibliographic entry see Field 7C.
W74-06648

EXPERIMENTAL MASKING OF RBV IMAGES TO REDUCE STATIONARY RESIDUAL INACCURACIES IN RADIOMETRIC CORRECTION,
International Imaging Systems, Mountain View, Calif.
For primary bibliographic entry see Field 7C.
W74-06649

DIGITAL RECTIFICATION OF ERTS MULTISPECTRAL IMAGERY,
TRW Systems Group, Redondo Beach, Calif.
For primary bibliographic entry see Field 7C.
W74-06650

RESULTS OF PRECISION PROCESSING (SCENE CORRECTION) OF ERTS-1 IMAGES USING DIGITAL IMAGE PROCESSING TECHNIQUES,
IBM Federal Systems Div., Gaithersburg, Md.
For primary bibliographic entry see Field 7C.
W74-06651

SIGNIFICANT TECHNIQUES IN THE PROCESSING AND INTERPRETATION OF ERTS-1 DATA,
Lockheed Electronics Co., Inc., Houston, Tex. Houston Aerospace Systems Div.
For primary bibliographic entry see Field 7C.
W74-06652

COMPUTER TECHNIQUES USED FOR SOME ENHANCEMENTS OF ERTS IMAGES,
Jet Propulsion Lab., Pasadena, Calif.
For primary bibliographic entry see Field 7C.
W74-06653

DIGITAL ENHANCEMENT OF MULTISPECTRAL MSS DATA FOR MAXIMUM IMAGE VISIBILITY,
California Univ., Davis. Dept. of Electrical Engineering.
For primary bibliographic entry see Field 7C.
W74-06654

ERTS-1 IMAGE ENHANCEMENT BY OPTICALLY COMBINING DENSITY SLICES,
California Univ., Riverside. Dept. of Geography.
For primary bibliographic entry see Field 7C.
W74-06655

PSEUDOCOLOR TRANSFORMATION OF ERTS IMAGERY,
RAND Corp., Santa Monica, Calif.
For primary bibliographic entry see Field 7C.
W74-06656

DIGITAL INTERACTIVE IMAGE ANALYSIS BY ARRAY PROCESSING,
Tetra Tech, Inc., Houston, Tex.
For primary bibliographic entry see Field 7C.
W74-06657

COMBINING HUMAN AND COMPUTER INTERPRETATION CAPABILITIES TO ANALYZE ERTS IMAGERY,
California Univ., Berkeley. Forestry Remote Sensing Lab.
For primary bibliographic entry see Field 7C.
W74-06658

ANALYSIS OF ERTS IMAGERY USING SPECIAL ELECTRONIC VIEWING/MEASURING EQUIPMENT,
Stanford Research Inst., Menlo Park, Calif.
For primary bibliographic entry see Field 7C.
W74-06659

COMBINED SPECTRAL AND SPATIAL PROCESSING OF ERTS IMAGERY DATA,
Kansas Univ., Lawrence. Space Technology Center.
For primary bibliographic entry see Field 7C.
W74-06660

TERRAIN TYPE RECOGNITION USING ERTS-1 MSS IMAGES,
Itek Corp., Lexington, Mass. Optical Systems Div.
For primary bibliographic entry see Field 7C.
W74-06661

CLASSIFICATION OF ERTS-1 MSS DATA BY CANONICAL ANALYSIS,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
For primary bibliographic entry see Field 7C.
W74-06662

DCP-COLLECTED ABSOLUTE TARGET REFLECTANCE SIGNATURES ASSIST ACCURATE INTERPRETATION OF ERTS-1 IMAGERY,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
For primary bibliographic entry see Field 7C.
W74-06688

UNIQUE CHARACTERISTICS OF ERTS,
Geological Survey, Washington, D.C.
A. P. Colvocoresses.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1523-1525, 1973.

Descriptors: *Remote sensing, Satellites(Artificial), *Data collections, Radiation, Wavelengths, Mapping, Surveys, Monitoring, Geologic mapping.
Identifiers: *ERTS.

ERTS-1 has unique characteristics or advantages in the electronic transmission (TV) earth-sensing system for the mapmaker. ERTS-1 may survive for 2 or more years and thus provide repetitive as well as complete coverage, making the most of only one launch, spacecraft, and instrument package. ERTS is proving that imagery can be electronically transmitted without serious distortion. The field of view of the ERTS MSS extends only 5.76 deg from the nominal vertical. The ERTS signals, particularly those of the MSS, are in effect those of a focusing radiometer, recording radiated energy with a range and precision well beyond the capability of any current film system. MSS band 7, at 0.8 to 1.1 microns, has opened a window for remote sensing for which operational film systems do not have a capability. Geologists and others are selecting MSS 7 as the best single band for depicting the earth's physiographic structure. (See also W74-06619) (Knapp-USGS)
W74-06689

ERTS-1 APPLIED FOR STRUCTURAL AND MORPHOLOGICAL INVESTIGATIONS CASE STUDIES: (1) LOS ANGELES, CALIFORNIA AND (2) COASTAL PLAIN, NEW JERSEY,
William Paterson Coll. of New Jersey, Wayne. Dept. of Geography.
For primary bibliographic entry see Field 7C.
W74-06690

THE USE OF PHOTOGRAPHIC METHODS IN CONTRAST ENHANCEMENT OF ERTS-1 IMAGES,
Geological Survey, Flagstaff, Ariz.
For primary bibliographic entry see Field 7C.
W74-06704

RELATIONSHIPS BETWEEN REMOTELY SENSED FISHERIES DISTRIBUTION INFORMATION AND SELECTED OCEANOGRAPHIC PARAMETERS IN THE MISSISSIPPI SOUND,
National Marine Fisheries Service, Pascagoula, Miss. Southeast Fisheries Center.
A. J. Kemmerer, and J. A. Benigno.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1685-1695, 1973. 2 fig, 5 tab, 6 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Fisheries, Oceanography,

Chlorophyll, Turbidity, Algae, Gulf of Mexico, Data collections, Data processing.
Identifiers: *ERTS, *Mississippi Sound.

A feasibility study to demonstrate the potential of ERTS for providing fisheries significant information was conducted in the Mississippi Sound and adjacent offshore waters. Attempts were made to relate satellite-acquired imagery to selected oceanographic parameters and then to relate these parameters to aircraft remotely sensed distribution patterns of resident surface schooling fishes. Initial results suggest that this approach is valid and that the satellite-acquired imagery may have important fisheries resource assessment implications. (See also W74-06619) (Knapp-USGS)
W74-06708

ADVANCED SCANNERS AND IMAGING SYSTEMS FOR EARTH OBSERVATIONS.
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
Available from Sup Doc, GPO, Washington, D C 20402, Price $3.90. Report SP-335, 1973. 604 p.

Descriptors: *Remote sensing, *Satellites(Artificial), Infrared radiation, Photography, Data transmission, Meteorology, Water resources, Data processing, Crops, Ice, Sea ice, Mapping, Geomorphology, Geology, Monitoring.

The Advanced Imagers and Scanners Working Group met at Cocoa Beach, Florida from December 11 to 15, 1972. The meeting addressed sensors, sensors systems and user applications for remote monitoring of the earth from orbiting satellites. The Working Group limited itself to consideration of electromechanical scanners and electronic imaging systems for the spectral region including the visible through the thermal infrared. The use of photographic cameras and film was addressed only briefly, and microwave imaging was excluded. In addressing remote sensing technology and its applications, the Working Group was asked to consider the present and then project into a period both 4 and 8 years hence, the growth of technical capability and the expansion of requirements in terms of performance specifications. Both broad assessments of present and future sensors and sensor related technology, as well as a description of user needs and applications are provided. (Knapp-USGS)
W74-06712

GAMMA RADIATION MEASUREMENTS OF BULK DENSITY CHANGES IN A SOIL PEDON FOLLOWING IRRIGATION,
Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.
For primary bibliographic entry see Field 2G.
W74-06715

MESOSCALE STRAIN MEASUREMENTS ON THE BEAUFORT SEA PACK ICE,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2C.
W74-06717

COMPUTER MONITORING OF PRECIPITATION IN HUNGARY,
For primary bibliographic entry see Field 2B.
W74-06726

MEASUREMENT OF HYDRAULIC CONDUCTIVITY BY MEANS OF STEADY, SPHERICALLY SYMMETRIC FLOWS,
Agricultural Research Service, Madison, Wis. Soil and Water Conservation Research Div.
For primary bibliographic entry see Field 2G.
W74-06735

A UNIVERSAL ION-SELECTIVE ELECTRODE BASED ON GRAPHITE PASTE,
Connecticut Univ., Storrs. Dept. of Chemistry.
For primary bibliographic entry see Field 2K.
W74-06758

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE FORT CALHOUN STATION, FORT CALHOUN, NEBRASKA, AUGUST 9-10, 1972.
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W74-06815

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE PALISADES PLANT, SOUTH HAVEN, MICHIGAN, JULY 29, 1970.
EG and G, Inc., Las Vegas Nev.
For primary bibliographic entry see Field 5A.
W74-06816

AERIAL RADIOLOGICAL MEASURING SURVEY OF THE AREA SURROUNDING THE ENRICO FERMI ATOMIC POWER PLANT, MONROE, MICHIGAN, SEPTEMBER 1970.
EG and G, Inc., Las Vegas, Nev.
For primary bibliographic entry see Field 5A.
W74-06817

GROUNDWATER TRACING WITH POST SAMPLING ACTIVATION ANALYSIS,
Pennsylvania State Univ., University Park.
For primary bibliographic entry see Field 2F.
W74-06889

A COMPARISON OF HYDRAULIC CONDUCTIVITIES CALCULATED WITH MORPHOMETRIC AND PHYSICAL METHODS,
Wisconsin Univ., Madison. Dept. of Soil Science.
For primary bibliographic entry see Field 2G.
W74-06899

AN ISOKINETIC SAMPLER FOR WIND EROSIBLE SILT AND CLAY PARTICLE MEASUREMENT,
Illinois Univ., Urbana. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2J.
W74-06902

ANALYSIS OF THE FEASIBILITY OF AN EXPERIMENT TO MEASURE CARBON MONOXIDE IN THE ATMOSPHERE,
General Electric Co., Philadelphia, Pa.
For primary bibliographic entry see Field 5A.
W74-06917

THE CBI POGO STICK CORER,
Johns Hopkins Univ., Baltimore, Md. Chesapeake Bay Inst.
J. R. Schubel, and E. W. Schiemer.
Special Report 34 (Reference 73-13), November 1973. 8 p, 4 fig, 1 ref.

Descriptors: *Core drilling, *Bottom sediments, Cores, Sampling, Mud, Sedimentology, Equipment.

The Chesapeake Bay Institute Pogo Stick Corer is a novel and useful device for collecting short, relatively undisturbed cores of fine-grained sediments in waters up to about 3 meters deep. The corer is patterned after a child's pogo stick. The operator thrusts the corer into the bottom by hand, then mounts the device and jumps it into the sediment. (Knapp-USGS)
W74-06923

RADAR STUDIES OF URBAN PRECIPITATION ANOMALY,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
For primary bibliographic entry see Field 2B.
W74-06938

ORIGIN OF CIRCULAR BEDS OF THALASSIA (SPERMATOPHYTA:HYDROCHARITACEAE) IN SOUTH BISCAYNE BAY, FLORIDA, AND THEIR RELATIONSHIP TO MANGROVE HAMMOCKS,
Virginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 5A.
W74-07022

7C. Evaluation, Processing and Publication

CLIMATIC DATA OF THE HIGH ALTITUDE METEOROLOGICAL STATIONS OF THE GENEVA REGION FOR 1970, (IN FRENCH),
Conservatoire Botanique, Geneva (Switzerland).
P. Hainard, J. Miege, O. Monthoux, and G. Tcheremissinoff.
Condollea. Vol 27, No 2, p 211-217. 1972, Illus. (English summary).
Identifiers: *Climatic data, High altitude, Meteorological stations, *Switzerland(Geneva).

Data for 1970 from 5 meteorological outposts are presented.--Copyright 1973, Biological Abstracts, Inc.
W74-06532

A COMPUTERIZED SOLUTION FOR BENCH LEVELING DESIGN,
Archer Daniels Midland Co., Lincoln, Neb.
For primary bibliographic entry see Field 4A.
W74-06600

SYMPOSIUM ON SIGNIFICANT RESULTS OBTAINED FROM THE EARTH RESOURCES TECHNOLOGY SATELLITE-1, VOLUME I: TECHNICAL PRESENTATIONS, SECTION B.
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
GPO, Washington, DC 20402, Price $13.65 domestic postpaid or $12.50 GPO Bookstore per set (Sect A and B). Symposium held at Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, Section B, 851 p, 1973.

Descriptors: *Remote sensing, *Satellites(Artificial), *Mapping, *Surveys, *Monitoring, Land use, Geologic mapping, Terrain analysis, Water resources, Snow, Ice, Lakes, Glaciers, Management, Planning, Water resources development, Wildlife.
Identifiers: *ERTS.

The first Earth Resources Technology Satellite (ERTS-1) was launched on July 23, 1972. In the 7 months since it was activated, over 34,000 scenes of the earth have been obtained covering all major land masses and about 75% of the world's land area. Some areas, such as the United States, have been imaged at least 12 times. The purpose of this program is to provide an assessment of remote sensing from a satellite as a technique for inventorying and monitoring the earth's resources to provide better management of these resources. The quality of the products produced by the ERTS-1 system during its initial period of operations is, from a resolution and radiometric accuracy viewpoint, quite consistent with prelaunch estimates. In the geometric sense, these data products are somewhat better (and in a few cases considerably better) than prelaunch estimates. (See W74-01663 and W74-06620 thru W74-06711) (Knapp-USGS)
W74-06619

CARTOGRAPHIC QUALITY OF ERTS-1 IMAGES,
Georgia Univ., Athens.
R. Welch.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 879-886, 1973. 2 fig, 2 tab, 6 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, Surveys, Geologic mapping, Terrain analysis, Topographic mapping, Data collections, Data processing.
Identifiers: *ERTS.

Analyses of simulated and operational ERTS images provide initial estimates of resolution, ground resolution, detectability thresholds and other measures of image quality of interest to earth scientists and cartographers. Ground resolution is about 250 meters for both RBV and MSS systems. The ERTS-1 images appear suited to the production and revision of planimetric and photo maps of 1:500,000 scale and smaller for which map accuracy standards are compatible with the imaged detail. Thematic mapping, although less constrained by map accuracy standards, will be influenced by measurement thresholds and errors which have yet to be accurately determined for ERTS images. (See also W74-06619) (Knapp-USGS)
W74-06620

PROGRESS IN CARTOGRAPHY, EROS PROGRAM,
Geological Survey, McLean, Va.
A. P. Colvocoresses, and R. B. McEwen.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 887-898, 1973. 2 fig, 3 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Mapping, Surveys, Geologic mapping, Terrain analysis, Topographic mapping, Data collections, Data processing.
Identifiers: *ERTS.

Several cartographic applications of ERTS imagery are described. Revising line maps is one in which the image is not retained, but the other applications defined to date retain the image or a derivative of the image. Monochromatic orthophotos are normally derived from one spectral band and portrayed in gray tones. Colors may be assigned as a function of density, but the basic input is a single gray-tone image. Polychromatic orthophotos are the color image application; with ERTS, they normally give a false-color rendition that includes the near-infrared. Autographic theme extraction is a derivative application that isolates one or more basic themes, such as water, snow and ice, or infrared-reflective vegetation. (See also W74-06619) (Knapp-USGS)
W74-06621

CHANGE IN LAND USE IN THE PHOENIX (1:250,000) QUADRANGLE, ARIZONA BETWEEN 1970 AND 1972: SUCCESSFUL USE OF A PROPOSED LAND USE CLASSIFICATION SYSTEM,
Geological Survey, Washington, D.C. Geographic Applications Program.
For primary bibliographic entry see Field 4A.
W74-06622

LAND USE INVESTIGATIONS IN THE CENTRAL VALLEY AND CENTRAL COASTAL TEST SITES, CALIFORNIA,
California Univ., Santa Barbara. Geography Remote Sensing Unit.
For primary bibliographic entry see Field 4A.
W74-06623

LAND USE IN NORTHERN COACHELLA VALLEY,
California Univ., Riverside. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W74-06624

LAND USE CLASSIFICATION AND CHANGE ANALYSIS USING ERTS-1 IMAGERY IN CARETS,
Geological Survey, Washington, D.C. Geographic Applications Program.
For primary bibliographic entry see Field 4A.
W74-06625

ERTS REGIONAL-SCALE OVERVIEW LINKING LAND USE AND ENVIRONMENTAL PROCESSES IN CARETS,
Geological Survey, Washington, D.C. Geographic Applications Program.
For primary bibliographic entry see Field 4A.
W74-06626

EVALUATION OF LAND USE MAPPING FROM ERTS IN THE SHORE ZONE OF CARETS,
Viginia Univ., Charlottesville. Dept. of Environmental Sciences.
For primary bibliographic entry see Field 4A.
W74-06627

GEOGRAPHIC APPLICATIONS OF ERTS-1 DATA TO LANDSCAPE CHANGE,
Tennessee Univ., Knoxville. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W74-06628

IDENTIFICATION OF SOIL ASSOCIATIONS IN WESTERN SOUTH DAKOTA ON ERTS-1 IMAGERY,
South Dakota State Univ., Brookings. Dept. of Plant Science; and South Dakota State Univ., Brookings. Remote Sensing Inst.
For primary bibliographic entry see Field 2G.
W74-06629

LAND USE OF NORTHERN MEGALOPOLIS,
Dartmouth Coll., Hanover, N. H.
For primary bibliographic entry see Field 4A.
W74-06630

REMOTE SENSING APPLIED TO LAND-USE STUDIES IN WYOMING,
Wyoming Univ., Laramie. Dept. of Geology.
For primary bibliographic entry see Field 4A.
W74-06631

ERTS-1 APPLICATIONS TO MINNESOTA LAND USE MAPPING,
Minnesota Univ., Minneapolis. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W74-06632

A MULTIDISCIPLINARY SURVEY FOR THE MANAGEMENT OF ALASKAN RESOURCES UTILIZING ERTS IMAGERY,
Alaska Univ., College.
For primary bibliographic entry see Field 4A.
W74-06633

THE USE OF ERTS-1 DATA FOR THE INVENTORY OF CRITICAL LAND RESOURCES FOR REGIONAL LAND USE PLANNING,
Wisconsin Univ., Madison.
For primary bibliographic entry see Field 4A.
W74-06634

INVESTIGATIONS OF AN URBAN AREA AND ITS LOCALE USING ERTS-1 DATA SUPPORTED BY U-PHOTOGRAPHY,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
For primary bibliographic entry see Field 4A.
W74-06635

FIRST LOOK ANALYSES OF FIVE CYCLES OF ERTS-1 IMAGERY OVER COUNTY OF LOS ANGELES: ASSESSMENT OF DATA UTILITY FOR URBAN DEVELOPMENT AND REGIONAL PLANNING,
General Electric Co., Philadelphia, Pa. Missile and Space Div.
For primary bibliographic entry see Field 4A.
W74-06636

PREPARATION OF URBAN LAND USE INVENTORIES BY MACHINE-PROCESSING OF ERTS MSS DATA,
Purdue Univ., Lafayette, Ind. Lab. for Applications of Remote Sensing.
For primary bibliographic entry see Field 4A.
W74-06637

A COMPARISON OF LAND-USE DETERMINATIONS USING DATA FROM ERTS-1 AND HIGH ALTITUDE AIRCRAFT,
National Aeronautics and Space Administration, Houston, Tex. Lyndon B. Johnson Space Center.
For primary bibliographic entry see Field 4A.
W74-06638

DIGITAL LAND USE MAPPING IN OAKLAND COUNTY, MICHIGAN,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 4A.
W74-06639

MAPPING OF AGRICULTURAL LAND USE FROM ERTS-1 DIGITAL DATA,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
For primary bibliographic entry see Field 4A.
W74-06640

THE USE OF THE TEMPORAL DIMENSION IN CLASSIFYING AND MAPPING ERTS-1 MSS DATA,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
For primary bibliographic entry see Field 4A.
W74-06641

IDENTIFICATION AND MAPPING OF COAL REFUSE BANKS AND OTHER TARGETS IN THE ANTHRACITE REGION,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
For primary bibliographic entry see Field 4A.
W74-06642

AUTOMATIC INTERPRETATION OF ERTS DATA FOR FOREST MANAGEMENT,
Honeywell, Inc., St. Paul, Minn. Systems and Research Center.
For primary bibliographic entry see Field 4A.
W74-06643

LAND RESOURCES SURVEY FOR THE STATE OF MICHIGAN,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 4A.
W74-06644

TERRAIN CLASSIFICATION MAPS OF YELLOWSTONE NATIONAL PARK,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 4A.
W74-06645

ATMOSPHERIC EFFECTS IN ERTS-1 DATA, AND ADVANCED INFORMATION EXTRACTION TECHNIQUES,
Environmental Research Inst. of Michigan, Ann Arbor.
W. A. Malila, and R. F. Nalepka.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1097-1104, 1973. 12 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, Data collections, Terrain analysis, Surveys, Mapping, Photogrammetry.
Identifiers: *ERTS.

Atmospheric effects in satellite multispectral scanner data can influence results obtained with either manual image interpretation or computer information extraction techniques. The atmosphere attenuates radiation arriving from the surface and adds an extraneous path radiance component. Empirical analyses of ERTS MSS data and simultaneous airborne MSS underflight data for one frame are compared. Theoretical calculations of atmospheric effects are discussed. The effect of limited spatial resolution on the accuracy of information extracted from ERTS data is important. Problems occur when individual resolution elements contain two or more materials. Results from an initial application of techniques for estimating proportions of materials within individual elements are presented and discussed. Very accurate determination of surface areas of small lakes is possible. (See also W74-06619) (Knapp-USGS)
W74-06646

DETERMINATION OF AEROSOL CONTENT IN THE ATMOSPHERE,
Science Applications, Inc., La Jolla, Calif.
M. Griggs.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1105-1113, 1973. 3 fig, 1 tab, 8 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Aerosols, *Data processing, *Climatology, Air pollution, Surveys, Pollutant identification.
Identifiers: *ERTS.

The feasibility of determining the aerosol content in the atmosphere from contrast measurements of ground features and from radiance measurements was studied using ERTS data. Theoretical relationships between aerosol content and contrast reduction and radiance were derived for ideal model atmospheres. Preliminary data analysis of the MSS transparencies is promising for determining the contrast-aerosol content relationship in the Salton Sea region. (See also W74-06619) (Knapp-USGS)
W74-06647

A TECHNIQUE FOR CORRECTING ERTS DATA FOR SOLAR AND ATMOSPHERIC EFFECTS,
Bendix Aerospace Systems Div. Ann Arbo, Mich.
R. H. Rogers, and K. Peacock.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1115-1122, 1973. 3 fig, 2 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Solar radiation, *Albedo, Atmosphere, Surveys, Data collections.
Identifiers: *ERTS.

ERTS can be used to obtain absolute target reflectances by correcting spacecraft radiance measurements for variable target irradiance, atmospheric attenuation, and atmospheric backscatter. A simple measuring instrument and the necessary atmospheric measurements are described, and example demonstrate the nature and magnitude of the atmospheric corrections. (See also W74-06619) (Knapp-USGS)
W74-06648

EXPERIMENTAL MASKING OF RBV IMAGES TO REDUCE STATIONARY RESIDUAL INACCURACIES IN RADIOMETRIC CORRECTION,
International Imaging Systems, Mountain View, Calif.
D. S. Ross.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1123-1128, 1973. 2 fig, 1 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Photogrammetry, Mapping, Surveys, Data collections.
Identifiers: *ERTS.

ERTS-1 vidicon image scenes show stationary, repetitive residual inaccuracies in shading correction, large enough to affect qualitative and quantitative image analyses. Photographic masks designed to reduce residual shading were prepared from vidicon images of a relatively cloud-free ocean scene of uniform reflectance. When applied to other scenes, the masks enable more closely corrected RBV images to be printed. Illustrations are given of vidicon images before and after correction, compared with an equivalent MSS spectral image of the same scene. (See also W74-06619) (Knapp-USGS)
W74-06649

DIGITAL RECTIFICATION OF ERTS MULTISPECTRAL IMAGERY,
TRW Systems Group, Redondo Beach, Calif.
S. S. Rifman.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technology Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1131-1142, 1973. 8 fig, 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

Rectified ERTS multispectral imagery is produced, utilizing all digital techniques, as the first step toward producing precision corrected imagery. The resultant image is mapped utilizing an intensity resampling technique. Negligible degradation of the photometric and resolution properties of the source data is caused by the geometric correction process. (See also W74-06619) (Knapp-USGS)
W74-06650

RESULTS OF PRECISION PROCESSING (SCENE CORRECTION) OF ERTS-1 IMAGES USING DIGITAL IMAGE PROCESSING TECHNIQUES,
IBM Federal Systems Div., Gaithersburg, Md.
R. Bernstein.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1143-1150, 1973. 1 fig, 4 tab, 4 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

ERTS-1 MSS and RBV data recorded on computer compatible tapes were analyzed and processed. No degradation of intensity (radiance) information occurred in implementing the geometric correction. The quality and resolution of the digitally processed images are very good, due primarily to the fact that the number of film generations and conversions is kept to a minimum. Processing times of digitally processed images are about equivalent to those of the electro-optical processor. (See also W74-06619) (Knapp-USGS)
W74-06651

SIGNIFICANT TECHNIQUES IN THE PROCESSING AND INTERPRETATION OF ERTS-1 DATA,
Lockheed Electronics Co., Inc., Houston, Tex. Houston Aerospace Systems Div.
S. B. Cousin, A. C. Anderson, J. F. Paris, and J. F. Potter.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1151-1158, 1973. 10 fig, 6 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

Investigations using ERTS-1 data provide an appropriate framework for the systematic evaluation of a prototype multispectral data processing and analysis system. The system is the integration of (1) a preprocessing subsystem, (2) a spectral clustering a subsystem, (3) a correlation and classification subsystem, (4) mensuration subsystem, and (5) an information management subsystem. Aircraft, ERTS and EREP data are utilized to refine the subsystem elements for systems or system combinations that are optimally suited for a specific earth resources application. (See also W74-06619) (Knapp-USGS)
W74-06652

COMPUTER TECHNIQUES USED FOR SOME ENHANCEMENTS OF ERTS IMAGES,
Jet Propulsion Lab., Pasadena, Calif.
F. C. Billingsley, and A. F. H. Goetz.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1159-1167, 1973. 7 fig, 1 tab, 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

The JPL VICAR Image Processing System was used for enhancement of images received from the ERTS for the Arizona geology mapping experiment. This system contains flexible capabilities for reading and repairing MSS digital tape images, for geometric corrections and interpicture registration, for various enhancements and analyses of the data, and for display of the images in black and white and color. (See also W74-06619) (Knapp-USGS)
W74-06653

DIGITAL ENHANCEMENT OF MULTISPECTRAL MSS DATA FOR MAXIMUM IMAGE VISIBILITY,
California Univ., Davis. Dept. of Electrical Engineering.
V. R. Algazi.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1169-1177, 1973. 8 fig, 11 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

A systematic approach to the enhancement of ERTS images exploits two principal features involved in the observation of images: the properties of human vision and the statistics of the images being observed. The rationale of the enhancement procedure is: in the observation of some features of interest in an image, the range of objective luminance-chrominance values is generally limited and does not use the whole perceptual range of vision of the observer. The purpose of the enhancement technique is to expand and distort in a systematic way the grey scale values of each of the multispectral bands making up a color composite, to enhance the average visibility of the features being observed. (See also W74-06619) (Knapp-USGS)
W74-06654

ERTS-1 IMAGE ENHANCEMENT BY OPTICALLY COMBINING DENSITY SLICES,
California Univ., Riverside. Dept. of Geography.
G. O. Tapper, and R. W. Pease.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1179-1185, 1973. 4 fig, 5 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Data collections.
Identifiers: *ERTS, Image enhancement.

The technique of density slicing using a photographic film and its application to enhancement of ERTS-1 imagery is useful for mapping. Initial experiments conducted with this film were encouraging and indicated that this technique of density slicing using readily accessible darkroom facilities and simple darkroom procedures allows rapid, accurate, and facile interpretation of the imagery. The distribution of the Tree Yucca in the Eastern Mojave Desert of southern California and southern Nevada was used to test the accuracy of the technique for mapping purposes. The distribution was mapped at a relatively high level of accuracy. (See also W74-06619) (Knapp-USGS)
W74-06655

PSEUDOCOLOR TRANSFORMATION OF ERTS IMAGERY,
RAND Corp., Santa Monica, Calif.
J. Lamar, and P. M. Merifield.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1187-1198, 1973. 7 fig, 11 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Geologic mapping, Photogrammetry, Terrain analysis, *California, Faults(Geologic).
Identifiers: *ERTS, False color transformations.

Human vision was studied to increase the effectiveness of detection and recognition of ground features in ERTS imagery. In the course of this work, a number of image enhancement techniques were developed. One of the photographic techniques which shows great promise as an aid in interpreting ERTS imagery is pseudocolor transformation. It is a process where each shade of gray in an original black-and-white image is seen as a different color in the transformation. The ERTS-1 MSS image of the Monterey Bay-San Francisco area was transformed using a technique which requires only two intermediate separations. Possible faults were delineated on an overlay before comparing imagery to geologic maps. All large active or recently active faults shown on the latest geologic map of California were interpreted from the image for all, or much, of their length. Perhaps the most interesting result was the Reliz fault. The fault is mapped as covered; however, a lineation corresponding to the position of the fault is visible on the image. Although the faults are also visible in the unenhanced image, they are clearly accentuated and more easily mapped on the pseudocolor transformation. (See also W74-06619) (Knapp-USGS)
W74-06656

DIGITAL INTERACTIVE IMAGE ANALYSIS BY ARRAY PROCESSING,
Tetra Tech, Inc., Houston, Tex.
B. E. Sabels, and J. D. Jennings.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1199-1203, 1973. Append.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

A survey of ERTS-1 investigations discloses several categories of efforts which can be compared with seismic data processing categories. Optical and digital filtering and enhancement techniques attempt to eliminate noise or improve contrast in the resulting display. With improved processing algorithms, these lead to classification techniques, and to hybrid selection and suppression methods. Spectral and spatial detection efforts are aimed at low signal-to-noise contrasts, for the detection of subtle shades of grey or the respective color, which represent differences in soils, chlorophyll, stress, infestation, or other manifestations of resources conditions. Seismic and ERTS data can be interchanged in government and industrial processing facilities. The array processor is an instrument to free the investigator from data processing chores, so that he can use his time more efficiently for the interpretation and utilization of the data. The service, patterned after the commercial seismic data processing industry, will therefore increase the potential for the application and utilization of ERTS data. (See also W74-06619) (Knapp-USGS)
W74-06657

COMBINING HUMAN AND COMPUTER INTERPRETATION CAPABILITIES TO ANALYZE ERTS IMAGERY,
California Univ., Berkeley. Forestry Remote Sensing Lab.
J. D. Nichols.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1205-1210, 1973. 2 fig.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

The human photo interpreter and the computer have complementary capabilities that are exploited in a computer-based data analysis system designed to optimize the process of extracting resource information from ERTS images. The human has the ability to quickly delineate gross differences in land classes, and to further break these gross classes into meaningful subclasses. The computer can more efficiently analyze point-by-point spectral information and localized textural information, which can result in much more detailed agricultural or wildland classification based on species composition and plant association. These human and computer capabilities are integrated through the use of an inexpensive computer dedicated to the interactive preprocessing of the human inputs and the display of raw ERTS images and computer classified images. The small computer is linked to a large-scale computer system, where the statistical work and the automatic point-by-point classification is done. (See also W74-06619) (Knapp-USGS)
W74-06658

ANALYSIS OF ERTS IMAGERY USING SPECIAL ELECTRONIC VIEWING/MEASURING EQUIPMENT,
Stanford Research Inst., Menlo Park, Calif.
W. E. Evans, and S. M. Serebreny.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1211-1218, 1973. 5 fig, 1 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

To process ERTS imagery, an Electronic Satellite Image Analysis Console (ESIAC) is being employed in studying dynamic hydrologic conditions. The ESIAC provides facilities for storing registered image sequences in a magnetic video disc memory for subsequent recall, enhancement, and animated display in monochrome or color. Quantitative measurements of distances, areas, and brightness profiles can be extracted digitally under operator supervision. Initial results are presented for the display and measurement of snowfield extent, glacier development, sediment plumes from estuary discharge, playa inventory, phreatophyte and other changes. (See also W74-06619) (Knapp-USGS)
W74-06659

COMBINED SPECTRAL AND SPATIAL PROCESSING OF ERTS IMAGERY DATA,
Kansas Univ., Lawrence. Space Technology Center.
R. M. Haralick, and K. S. Shanmugam.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentation, Sect B, Goddard

Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1219-1228, 1973. 3 fig, 1 tab, 7 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

A procedure for extracting a set of textural features for ERTS MSS data is presented. The textural features were combined with a set of spectral features and were used to develop a classification algorithm for identifying the land use categories of blocks of digital MSS data. The classification algorithm was derived from a training set of 314 blocks and tested on a set of 310 blocks. The overall accuracy of the classifier was found to be 83.5% on seven land use categories. (See also W74-06619) (Knapp-USGS)
W74-06660

TERRAIN TYPE RECOGNITION USING ERTS-1 MSS IMAGES,
Itek Corp., Lexington, Mass. Optical Systems Div.
N. Gramenopoulos.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1229-1241, 1973. 4 fig, 1 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections.
Identifiers: *ERTS, Image enhancement.

For the automatic recognition of earth resources from ERTS-1 digital tapes, both multispectral and spatial pattern recognition techniques are important. Recognition of terrain types is based on spatial signatures that become evident by processing small portions of an image through selected algorithms. Spatial signatures that are applicable to ERTS-1 MSS images were analyzed. Artifacts in the spatial signatures seem to be related to the multispectral scanner. A method for suppressing such artifacts is presented. The recognition of terrain types is accurate for desert (97%), farms (89%), and mountains (80%). The accuracy for urban areas is lower (74%), and poor for riverbeds (11%). Most of the errors in the urban category seem to occur in thinly populated areas associated with recent urban expansion into desert, farms, riverbeds, and hills. (See also W74-06619) (Knapp-USGS)
W74-06661

CLASSIFICATION OF ERTS-1 MSS DATA BY CANONICAL ANALYSIS,
Pennsylvania State Univ., University Park. Office for Remote Sensing of Earth Resources.
H. M. Lachowski, and F. Y. Borden.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1243-1251, 1973. 4 fig, 3 tab, 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, *Calibrations, Surveys, Mapping, Photogrammetry, Terrain analysis, Digital computers, Data collections, Statistical methods.
Identifiers: *ERTS, Image enhancement, Canonical analysis.

The objective of canonical analysis is to obtain the maximum separability among a number of categories. The application of canonical analysis was investigated using MSS ERTS-1 data for one area viewed on two dates. The effect of threshold values on classification regions and confusion regions was investigated. The test area was chosen because it was familiar and had a variety of natural and cultural targets. The specific targets that were selected for study were river water, the railroad yard, two suburban targets, and two vegetation targets. The canonical analysis of the test data showed that essentially all of the separability (99.9%) among the six categories could be recovered in four canonical axes. The four axes accounted for 88.5, 11.1, 0.2, and 0.06%, respectively, of the separability. (See also W74-06619) (Knapp-USGS)
W74-06662

IN SITU SPECTRORADIOMETRIC QUANTIFICATION OF ERTS DATA,
Long Island Univ., Greenvale, N.Y. Science Engineering Research Group.
For primary bibliographic entry see Field 2G.
W74-06663

SEASONAL CHANGES OF LITTORAL TRANSPORT AND BEACH WIDTH AND RESULTING EFFECT ON PROTECTIVE STRUCTURES,
Maryland Geological Survey, Baltimore.
For primary bibliographic entry see Field 2L.
W74-06664

RECOGNITION OF BEACH AND NEARSHORE DEPOSITIONAL FEATURES OF CHESAPEAKE BAY,
Maryland Geological Survey, Baltimore.
For primary bibliographic entry see Field 2L.
W74-06665

APPLICABILITY OF ERTS-1 IMAGERY TO THE STUDY OF SUSPENDED SEDIMENT AND AQUATIC FRONTS,
Delaware Univ., Newark. Coll. of Marine Studies.
For primary bibliographic entry see Field 2L.
W74-06666

CORRELATION OF ERTS MULTISPECTRAL IMAGERY WITH SUSPENDED MATTER AND CHLOROPHYLL IN LOWER CHESAPEAKE BAY,
National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center.
For primary bibliographic entry see Field 2L.
W74-06667

PLUME DEVELOPMENT IN LONG ISLAND SOUND OBSERVED BY REMOTE SENSING (ERTS-1),
Geological Survey, Hartford, Conn.
For primary bibliographic entry see Field 2L.
W74-06668

NEW INSIGHTS INTO THE INFLUENCE OF ICE ON THE COASTAL MARINE ENVIRONMENT OF THE BEAUFORT SEA, ALASKA,
Geological Survey, Menlo Park, Calif. Office of Marine Geology and Hydrology.
For primary bibliographic entry see Field 2C.
W74-06669

ERTS-1 OBSERVATIONS OF SEA SURFACE CIRCULATION AND SEDIMENT TRANSPORT, COOK INLET, ALASKA,
Alaska Univ., College. Inst. of Marine Science.
For primary bibliographic entry see Field 2L.
W74-06670

SEDIMENT DISTRIBUTION AND COASTAL PROCESSES IN COOK INLET, ALASKA,
Cold Regions Research and Engineering Lab., Hanover, N.H.
For primary bibliographic entry see Field 2L.
W74-06671

DISTRIBUTION AND MOVEMENT OF SUSPENDED SEDIMENT IN THE GULF OF MEXICO OFF THE TEXAS COAST,
Geological Survey, Corpus Christi, Tex.
For primary bibliographic entry see Field 2L.
W74-06672

OCEANOGRAPHIC MAPPING OF STRUCTURE AND DYNAMICS OF THE NORTHERN GULF OF CALIFORNIA BY THE USE OF SPECTRAL MODELING AND ERTS-1,
Arizona Univ., Tucson.
For primary bibliographic entry see Field 2L.
W74-06673

OCEANOGRAPHIC FEATURES IN THE LEE OF THE WINDWARD AND LEEWARD ISLANDS: ERTS AND SHIP DATA,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 2E.
W74-06674

REMOTE SENSING OF OCEAN CURRENTS USING ERTS IMAGERY,
National Oceanic and Atmospheric Administration, Miami, Fla. Atlantic Oceanographic and Meteorological Labs.
For primary bibliographic entry see Field 2L.
W74-06675

USE OF ERTS DATA FOR MAPPING ARCTIC SEA ICE,
Environmental Research and Technology, Inc., Lexington, Mass.
For primary bibliographic entry see Field 2C.
W74-06676

BIOMASS IN THE UPWELLING AREAS ALONG THE NORTHWEST COAST OF AFRICA AS VIEWED WITH ERTS-1,
Delaware Univ., Newark.
For primary bibliographic entry see Field 5A.
W74-06677

APPLICATION OF ERTS-1 IMAGERY TO THE HARVEST MODEL OF THE U.S. MENHADEN FISHERY,
Earth Satellite Corp., Washington, D.C.
For primary bibliographic entry see Field 2L.
W74-06678

COASTAL AND SUBMARINE FEATURES ON MSS IMAGERY OF SOUTHEASTERN MASSACHUSETTS: COMPARISON WITH CONVENTIONAL MAPS,
Geological Survey, Reston, Va. EROS Program Office.
For primary bibliographic entry see Field 2L.
W74-06679

WATER DEPTH ESTIMATION WITH ERTS-1 IMAGERY,
International Imaging Systems, Mountain View, Calif.
For primary bibliographic entry see Field 2L.
W74-06680

CALCULATIONS OF WATER DEPTH FROM ERTS-MSS DATA,
Environmental Research Inst. of Michigan, Ann Arbor.
For primary bibliographic entry see Field 2E.
W74-06681

MULTIDISCIPLINARY APPLICATION OF ERTS-1 DATA TO NORTH CAROLINA NATURAL RESOURCE MANAGEMENT,
North Carolina State Univ., Raleigh.
For primary bibliographic entry see Field 4C.
W74-06682

NATURAL RESOURCE INVENTORY AND MONITORING IN OREGON WITH ERTS IMAGERY,
Oregon State Univ., Corvallis.
For primary bibliographic entry see Field 4A.
W74-06683

RESOURCE MANAGEMENT IMPLICATIONS OF ERTS-1 DATA TO OHIO,
Ohio Dept. of Economic and Community Development, Columbus.
For primary bibliographic entry see Field 4A.
W74-06684

ASSESSMENT OF SOUTHERN CALIFORNIA ENVIRONMENT FROM ERTS-1,
California Univ., Riverside. Dept. of Geography.
For primary bibliographic entry see Field 4A.
W74-06685

APPLICATIONS OF REMOTE SENSING (ERTS) TO RESOURCE MANAGEMENT AND DEVELOPMENT IN SAHELIEN AFRICA (REPUBLIC OF MALI),
American Univ., Washington, D.C. Dept. of Biology.
For primary bibliographic entry see Field 4A.
W74-06686

FIRST ERTS-1 RESULTS IN SOUTHEASTERN FRANCE: GEOLOGY, SEDIMENTOLOGY, POLLUTION AT SEA,
Institut Francais du Petrole, des Carburants et Lubrifiants, Rueil-Malmaison (France).
For primary bibliographic entry see Field 4A.
W74-06687

DCP-COLLECTED ABSOLUTE TARGET REFLECTANCE SIGNATURES ASSIST ACCURATE INTERPRETATION OF ERTS-1 IMAGERY,
Forest Service (USDA), Berkeley, Calif. Pacific Southwest Forest and Range Experiment Station.
F. P. Weber.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1513-1522, 1973. 8 fig, 4 tab.

Descriptors: *Remote sensing, Satellites(Artificial), *Calibrations, *Radiation, *Albedo, Data collections, Data processing, *South Dakota, Forests, Telemetry, Grasslands, Mining.
Identifiers: *ERTS.

Data collection platforms are being used at a Black Hills, South Dakota, test site to record radiometric measurements needed to determine solar and atmospheric parameters that affect ERTS-1 multispectral scanner radiance measurements. A total of 72 channels of analog data are transmitted from an unattended ground truth site at least six times a day. The system has operated with only minor problems, sending forth daily measurements of biophysical responses and atmospheric conditions. Comparisons of scene radiance data calculated from ERTS images with those measured on the ground show the image-measured values to be 35% higher for the green channel and 20% higher for the red channel for the same scene targets. Radiance values for channels 6 and 7 are nearly the same from the ground data as from the imagery. (See also W74-06619) (Knapp-USGS)
W74-06688

UNIQUE CHARACTERISTICS OF ERTS,
Geological Survey, Washington, D.C.
For primary bibliographic entry see Field 7B.
W74-06689

ERTS-1 APPLIED FOR STRUCTURAL AND MORPHOLOGICAL INVESTIGATIONS CASE STUDIES: (1) LOS ANGELES, CALIFORNIA AND (2) COASTAL PLAIN, NEW JERSEY,
William Paterson Coll. of New Jersey, Wayne. Dept. of Geography.
E. Y. Kedar.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1527-1538, 1973. 6 fig, 29 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data collections, Radiation, Wavelengths, Mapping, Surveys, Monitoring, Geologic mapping, Coastal plains, New Jersey, California.
Identifiers: *ERTS, Los Angeles.

ERTS-1 image, which covers the area from South Los Angeles to the Mojave Desert and from Eastern San Gabriel Mts to Cuyama Valley and Central Santa Ynez Mts of the Transverse Ranges, California, was analyzed. This image was studied in conjunction with the following conventional sources: (1) the Los Angeles sheet of the geologic map of California; (2) the map of the geology of the Central Santa Ynez Mountains, Santa Barbara County, California; (3) the geologic map of Transverse Ranges, Southern California. ERTS-1 image, which covers the area from the Palisades, New York-New Jersey to Burlington, New Jersey, and from New Brunswick, New Jersey to the great Pecomic Bay, New York, was also analyzed. This image was compared with: (1) the geologic map of New Jersey 1:1,000,000; (2) the geologic map of New Jersey 1:250,000; and (3) selected maps as published in the geology of selected areas in New Jersey and Eastern Pennsylvania. Conventional sources, including field investigation, were found to be inadequate to supply all the required structural and paleohydrographic information needed. ERTS-1 was found to be an essential supplementary source of information for geologic explorations, much like and even better than space photography from manned spacecraft and SLR imagery. (See also W74-06619) (Knapp-USGS)
W74-06690

A PRELIMINARY EVALUATION OF ERTS-1 IMAGES ON THE VOLCANIC AREAS OF SOUTHERN ITALY (NASA CONTRACT FO-013),
Consiglio Nazionale delle Ricerche, Milan (Italy). Laboratorio per la Geofisica della Litosfera.
R. Cassinis, and G. M. Lechi.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1539-1548, 1973. 5 fig.

Descriptors: *Remote sensing, Satellites(Artifical), *Geologic mapping, *Volcanoes, Data collections, Structural geology, Geothermal studies.
Identifiers: *ERTS, *Italy, *Sicily.

ERTS data were evaluated in a test site including all the regions of active and quiescent volcanism in southern Italy. The three active European volcanoes (Etna, Stromboli and Vesuvius) were included. Good results were obtained particularly on the southeast of Sicily over the Ragusan plateau, where several faults are clearly observed. In some cases a better pattern recognition is reached by the synoptic power of the ERTS enhanced images. (See also W74-06619) (Knapp-USGS)
W74-06691

THERMAL SURVEILLANCE OF CASCADE RANGE VOLCANOES USING ERTS-1 MULTISPECTRAL SCANNER, AIRCRAFT IMAGING SYSTEMS, AND GROUND-BASED DATA COMMUNICATION PLATFORMS,
Geological Survey, Washington, D.C.
J. D. Friedman, D. G. Frank, D. Preble, and J. E. Painter.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1549-1560, 1973. 6 fig, 9 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Geologic mapping, *Volcanoes, Data collections, Structural geology, *Geothermal studies.
Identifiers: *ERTS, *Iceland(Cascade Range).

A combination of infrared images and ground calibration points is particularly useful in plotting changes in surface temperatues and radiance and in delimiting areas of predominantly convective heat flow to the earth's surface in the Cascade Range and on Surtsey Volcano, Iceland. ERTS-1 Multispectral Scanner (MSS) and aircraft infrared imaging systems were used in conjunction with multiple thermistor arrays to study volcano surface temperatures. The data are relayed daily to Washington via Data Communication Platform (DCP) transmitters and ERTS-1. ERTS-1 MSS imagery reveals curvilinear structures at Lassen, the full extent of which have not been previously mapped. Interestingly, the major surface thermal manifestations at Lassen are aligned along these structures, particularly in the Warner Valley. On Lassen Peak, and possibly at Mt. St. Helens, smaller thermal anomalies are controlled by the contact margins of silicic or intermediate extrusive plugs. (See also W74-06619) (Knapp-USGS)
W74-06692

INITIAL EVALUATION OF THE GEOLOGIC APPLICATIONS OF ERTS-1 IMAGERY FOR NEW MEXICO,
New Mexico Bureau of Mines and Mineral Resources, Socorro.
For primary bibliographic entry see Field 4A.
W74-06693

COMPUTED ATMOSPHERIC EFFECTS ON ERTS OBSERVATIONS,
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 2B.
W74-06694

MAPPING OF SPOIL BANKS USING ERTS-1 PICTURES,
Ohio Univ., Athens. Dept. of Geology.
For primary bibliographic entry see Field 5A.
W74-06695

AIR QUALITY INDICES FROM ERTS-1 MSS INFORMATION, PR 568,
MITRE Corp., McLean, Va.
For primary bibliographic entry see Field 5A.
W74-06696

SNOW COVER SURVEYS IN ALASKA FROM ERTS-1 DATA,
Alaska Univ., College.
For primary bibliographic entry see Field 2C.
W74-06697

UTILIZATION OF ERTS-1 DATA TO MONITOR AND CLASSIFY EUTROPHICATION OF INLAND LAKES,
Bendix Corp., Ann Arbor, Mich.
For primary bibliographic entry see Field 5A.
W74-06698

ERTS-1 OBSERVES ALGAL BLOOM IN LAKE ERIE AND UTAH LAKE,
National Environmental Satellite Service, Washington, D.C.
For primary bibliographic entry see Field 5A.
W74-06699

USE OF ERTS-1 DATA FOR REGIONAL PLANNING IN THE METROPOLITAN WASHINGTON COUNCIL OF GOVERNMENTS--A SHORT BRIEF,
Metropolitan Washington Council of Governments, D.C. Remote Sensing Project.
For primary bibliographic entry see Field 4A.
W74-06700

LAND USE MAPPING AND CHANGE DETECTION USING ERTS IMAGERY IN MONTGOMERY COUNTY, ALABAMA,
Alabama Univ., University. Dept. of Civil and Mineral Engineering.
For primary bibliographic entry see Field 4A.
W74-06701

DETERMINATION OF LAND USE IN MINNESOTA BY AUTOMATIC INTERPRETATION OF ERTS MSS DATA,
Honeywell, Inc., St. Paul, Minn. Systems and Research Center.
For primary bibliographic entry see Field 4A.
W74-06702

DIGITAL DATA PROCESSING OF ERTS-1 IMAGERY OF DELAWARE BAY,
Bendix Aerospace Systems Div., Ann Arbor, Mich.
For primary bibliographic entry see Field 2L.
W74-06703

THE USE OF PHOTOGRAPHIC METHODS IN CONTRAST ENHANCEMENT OF ERTS-1 IMAGES,
Geological Survey, Flagstaff, Ariz.
L. F. Harris.
In: Symposium on Significant Results Obtained from the Earth Resources Technology Satellite-1: Vol I--Technical Presentations, Sect B, Goddard Space Flight Center, New Carrollton, Md, March 5-9, 1973: National Aeronautics and Space Admin Rept NASA SP-327, p 1649-1659, 1973. 5 fig, 3 tab, 2 ref.

Descriptors: *Remote sensing, Satellites(Artificial), *Data processing, Photography, Data collections, Geomorphology.
Identifiers: *ERTS, *Photographic processing.

The contrast of ERTS 70 mm positive images can be enhanced to varying degrees by rephotographing the images with different types of negative films and by overdeveloping the films with different developers. A combination of high-contrast copy film and a high-energy developer yields high contrast. Still greater contrast may be obtained by using a film of higher contrast capability and a developer of higher energy capability. Contrast can also be enhanced in the printing process with the use of high-contrast photographic papers, or with the use of polycontrast photographic paper and filters. Contrast enhancement by photocopying delineates topographic boundaries and may aid in the objective measurement of topographic parameters. (See also W74-06619) (Knapp-USGS)
W74-06704

PRECISION ANNOTATION OF PREDETERMINED PRIMARY SAMPLING UNITS ON ERTS-1 MSS IMAGES,
Earth Satellite Corp., Berkeley, Calif.
For primary bibliographic entry see Field 4A.
W74-06705

UNSUPERVISED CLASSIFICATION AND AREAL MEASUREMENT OF LAND AND WATER COASTAL FEATURES ON THE TEXAS COAST,
Lockheed Electronics Co., Inc., Houston, Tex. Aerospace Systems Div.
For primary bibliographic entry see Field 2L.
W74-06706

USE OF ERTS-1 PICTURES IN COASTAL OCEANOGRAPHY IN BRITISH COLUMBIA,
Department of the Environment, Victoria (British Columbia). Marine Sciences Branch (Pacific Region).
For primary bibliographic entry see Field 2L.
W74-06707

RELATIONSHIPS BETWEEN REMOTELY SENSED FISHERIES DISTRIBUTION INFORMATION AND SELECTED OCEANOGRAPHIC PARAMETERS IN THE MISSISSIPPI SOUND,
National Marine Fisheries Service, Pascagoula, Miss. Southeast Fisheries Center.
For primary bibliographic entry see Field 7B.
W74-06708

APPLICATION OF ERTS-1 IMAGERY IN COASTAL STUDIES,
Army Engineer Div. South Pacific, San Francisco, Calif. Coastal Engineering Branch.
For primary bibliographic entry see Field 2L.
W74-06709

APPLICATION OF ERTS-1 IMAGERY IN THE FIELDS OF GEOLOGY, AGRICULTURE, FORESTRY, AND HYDROLOGY TO SELECTED TEST SITES IN IRAN,
Imperial Government of Iran, Tehran. Plan Organization.
For primary bibliographic entry see Field 4A.
W74-06710

DETECTION OF TURBIDITY DYNAMICS IN TAMPA BAY, FLORIDA USING MULTISPECTRAL IMAGERY FROM ERTS-1,
Geological Survey, Tampa, Fla.
For primary bibliographic entry see Field 2L.
W74-06711

ADVANCED SCANNERS AND IMAGING SYSTEMS FOR EARTH OBSERVATIONS.
National Aeronautics and Space Administration, Greenbelt, Md. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W74-06712

HYDROLOGIC DATA FROM THE PICEANCE BASIN, COLORADO.
Geological Survey, Denver, Colo.
For primary bibliographic entry see Field 4B.
W74-06714

AUTOMATIC PROCESSING AND VERIFICATION OF METEOROLOGICAL OBSERVATIONS.
Hydrometeorological Service of the USSR, Moscow.
For primary bibliographic entry see Field 2B.
W74-06722

MACHINE CONTROL OF THE QUALITY OF OBSERVATIONS IN AUTOMATED HYDROMETEOROLOGICAL-DATA PROCESSING,
For primary bibliographic entry see Field 2B.
W74-06723

FUNDAMENTALS OF AUTOMATIC CONTROL OF METEOROLOGICAL DATA,
For primary bibliographic entry see Field 2B.
W74-06724

AUTOMATIC CHECK AND CORRECTION OF METEOROLOGICAL DATA IN EAST GERMANY,
For primary bibliographic entry see Field 2B.
W74-06725

AUTOMATIC MONITORING OF DAILY RESULTS OF BASIC METEOROLOGICAL OBSERVATIONS,
For primary bibliographic entry see Field 2B.
W74-06727

AUTOMATIC METHOD OF MONITORING THE QUALITY OF MEAN MONTHLY METEOROLOGICAL DATA,
For primary bibliographic entry see Field 2B.
W74-06728

AUTOMATIC MONITORING OF PROCESSING OF DAILY RADIOSONDE DATA ON TEMPERATURE AND GEOPOTENTIAL,
For primary bibliographic entry see Field 2B.
W74-06729

AUTOMATIC MONITORING AND PROCESSING OF HOURLY HYDROMETEOROLOGICAL INFORMATION,
For primary bibliographic entry see Field 2B.
W74-06730

SOME PRINCIPLES OF OBJECTIVE CONTROL OF MARINE METEOROLOGICAL INFORMATION,
For primary bibliographic entry see Field 2B.
W74-06731

AUTOMATIC PROCESSING OF RAINFALL DATA,
For primary bibliographic entry see Field 2B.
W74-06732

AN ALGORITHM FOR MONITORING HYDROMETEOROLOGICAL INFORMATION,
For primary bibliographic entry see Field 2B.
W74-06733

SAMPLE SIZES REQUIRED FOR TWO-SIDED COMPARISONS OF TWO TREATMENTS WITH A CONTROL,
National Research Inst. for Mathematical Sciences, Pretoria (South Africa).
F. E. Steffens, and R. de Villiers.
Technometrics, Vol 15, No 4, p 915-921, November 1973. 5 tab, 5 ref.

Descriptors: *Statistical methods, *Testing, Mathematical studies, Quality control, Probability, Control.
Identifiers: Comparison, Sample size, Bivariate t-test.

The two-sided bivariate t-test for simultaneous comparison of two treatments with a control is studies. The problem of allocating a given number of observations to the treatments and the control is discussed, and it is concluded that, in the absence

of preferences, a general purpose rule would be to choose the sample sizes equal. A table is presented which gives the sample size required to ensure that the null hypothesis will be rejected with at least a prescribed probability, given the significance level and the standardized differences between the treatments and the control. Similar tables are provided for use when the object is to ensure that both treatment means will be found significantly different from the control mean with at least a given probability, or to ensure that a specified treatment will be found significant with at least a given probability. (Mortland-Battelle)
W74-06746

DIGITAL CONTROL ALGORITHMS. PART III. TUNING PI AND PID CONTROLLERS,
Louisiana State Univ., Baton Rouge.
K-C. Chiu, A. B. Corripio, and C. L. Smith.
Instruments and Control Systems, Vol 46, No 12, p 41-43, December 1973. 2 fig, 5 tab, 2 ref.

Descriptors: *Automatic control, *Algorithms, Automation.
Identifiers: *Process control, *Digital control, PID controllers, PI controllers, Digital feedback, Kalman algorithm.

Common practice in the process industries is to use the discrete equivalent of the three-mode proportional-plus-integral-plus-derivative (PID) controller for digital feedback loops. A number of unique discrete algorithms have also been developed, but little industrial acceptance has been found except in cases such as basis weight and moisture control on paper machines where dead time renders PID systems ineffective. This article is the third in a series comparing the performance of several discrete algorithms with three mode control, for processes in which time constants rather than dead time dominate. Complete generalization is not possible. However, comparisons will be based on a model of a jacketed backmix reactor, which is representative of many real processes. (Mortland-Battelle)
W74-06750

THE EXREM III COMPUTER CODE FOR ESTIMATING EXTERNAL RADIATION DOSES TO POPULATIONS FROM ENVIRONMENTAL RELEASES,
Oak Ridge National Lab., Tenn. Radiation Shielding Information Center.
For primary bibliographic entry see Field 5B.
W74-06818

ENVIRONMENTAL SCIENCES DIVISION ANNUAL PROGRESS REPORT FOR PERIOD ENDING SEPTEMBER 30, 1973,
Oak Ridge National Lab., Tenn.
For primary bibliographic entry see Field 5B.
W74-06826

CANCELLATION OF SPECTROPHOTOMETER SYSTEM CHARACTERISTICS USING AN ANALOG COMPUTER,
Department of Agriculture, Ottawa (Ontario). Engineering Research Service.
For primary bibliographic entry see Field 2K.
W74-06874

QUANTITATIVE METHODS FOR PRELIMINARY DESIGN OF WATER QUALITY SURVEILLANCE SYSTEMS,
Raytheon Co., Portsmouth, R. I. Oceanographic and Environmental Services.
For primary bibliographic entry see Field 5A.
W74-06885

ASSESSING SYSTEMATIC ERRORS IN RAINFALL-RUNOFF MODELS,
Snowy Mountains Engineering Corp., Cooma (Australia).
For primary bibliographic entry see Field 2A.
W74-06893

DETERMINATION OF THE CONFIDENCE INTERVALS OF THE PEARSON III LAW USING ORDER STATISTICS (DETERMINATION DES INTERVALLES DE CONFIANCE DE LA LOI PEARSON III PAR LES STATISTIQUES D'ORDRE),
National Inst. of Scientific Research, Quebec.
For primary bibliographic entry see Field 2E.
W74-06906

ON FLOOD PROBABILITIES OF EAST ALPINE RIVERS,
Zentralanstalt fuer Meteorologie und Geodynamik, Vienna (Austria).
For primary bibliographic entry see Field 2E.
W74-06909

EFFECTS OF GROUND-WATER DEVELOPMENT ON THE PROPOSED PALMETTO BEND DAM AND RESERVOIR IN SOUTHEAST TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W74-06920

EIGHT YEARS OF OBSERVATIONS ON THE WATER LEVEL AT QUEBEC AND GRONDINES 1962-1969: PART I--ANALYSIS OF THE TIDAL SIGNAL,
Department of the Environment, Ottawa (Ontario). Marine Sciences Directorate.
For primary bibliographic entry see Field 2E.
W74-06926

METROMEX TEMPERATURE AND AEROSOL DATA REDUCTION: ANALYSIS OF THE URBAN ANOMALY,
Chicago Univ., Ill. Dept. of the Geophysical Sciences.
For primary bibliographic entry see Field 2B.
W74-06941

FLOOD OF OCTOBER 1972 AT PETERSBURG AND COLONIAL HEIGHTS, VIRGINIA,
Geological Survey, Washington, D. C.
E. M. Miller, and P. N. Walker.
For sale by USGS, Washington, D. C. 20242, Price $0.75. Hydrologic Investigations Atlas HA-505, 1973. 1 sheet, 2 fig, 1 photo, 3 ref. NSF Grant GA 28190XI.

Descriptors: *Historic floods, Floods, *Virginia, *Flood data, *Flood discharge, Peak discharge, Flood frequency, Flood recurrence interval, Flood profiles, *Maps.
Identifiers: Petersburg(Va), *Appomattox River(Va).

The areas inundated by the Appomattox River at Petersburg, Va., and by Swift Creek at Colonial Heights, Va., during the flood of October 1972 are shown on a topographic base map. The flood, the highest known on the Appomattox River, was caused by heavy rains which accompanied a low-pressure system that stagnated off the Virginia-North Carolina Coast. The flood of October 1972 reached an elevation of 86.69 feet above mean sea level (msl) at the gaging station on the Appomattox River at Matoaca, Va., (drainage area, 1,344 sq mi) and was the highest since records began in October 1969. The peak discharge on October 7, 1972, was 40,800 cfs at Matoaca as compared with a peak discharge of 28,000 cfs on August 20, 1940, the second highest flood of record. The stage-frequency relation derived from the record of annual floods for period 1927-66 at the U.S. Geological Survey gaging station near Petersburg and for period 1970-72 at the Virginia Bureau of Water Resources gaging station at Matoaca is shown. The 1972 flood had a recurrence interval of about 80 years, whereas the 1940 flood had a recurrence interval of about 30 years. Profiles of the water surface of the Appomattox River during the floods of October 1972 and August 1940 are shown. (Knapp-USGS)
W74-06957

HYDROLOGY AND WATER RESOURCES OF THE HOOSIC RIVER BASIN, MASSACHUSETTS,
Geological Survey, Washington, D.C.
B. P. Hansen, L. G. Toler, and F. B. Gay.
For sale by USGS, Washington, D.C. 20244 Price $1.00 per set. Hydrologic Investigations Atlas HA-481, 2 sheets, 1973. 23 fig, 1 map, 28 ref.

Descriptors: *Water resources, *Massachusetts, *Surface waters, *Groundwater, Floods, Water quality, *Maps, Flood profiles, Hydrogeology, Water yield, Hydrologic data, Runoff, Streamflow.
Identifiers: *Hoosic River basin(Mass).

Information is provided on the quantity, quality, and availability of water in that part of the Hoosic River basin located in Massachusetts. Deep bedrock valleys along the main stem have been filled with more than 300 feet, in places, of glacial lake sediments and outwash deposits, which form the main groundwater reservoirs in the basin. Higher elevations expose the bedrock or are covered with varying thicknesses of glacial till. Drainage is in well-defined channels. The regimen along the main stem has been altered by Cheshire Reservoir and construction of flood control structures in Adams and North Adams. The main valley of the Hoosic River is underlain by stratified unconsolidated material, which is over 300 feet thick locally. Most of this material is fine-grained and will yield very little water to wells. Dposits of sand and gravel within the fine-grained material yield large volumes of water. Some unconsolidated deposits may be hydraulically connected to the carbonate bedrock aquifer that underlies most of the valley, which may result in artesian conditions. The magnitude of a flood at selected frequencies can be estimated from regional flood frequency formulas. The concentration of suspended sediment varies with discharge and is highest during periods of spring runoff. Lower water temperature and less biochemical activity results in higher concentrations of dissolved oxygen and less diurnal variation in December. Regional draft-storage frequency analyses are given. (Knapp-USGS)
W74-06958

AVAILABILITY OF GROUND WATER IN THE GRANTS PASS AREA, JOSEPHINE COUNTY, OREGON,
Geological Survey, Washington, D. C.
J. H. Robison.
For Sale by USGS, Washington, D. C. 20242, Price $1.00 per set. Hydrologic Investigations Atlas HA-480, 1973. 2 sheets, 7 fig, 1 map, 1 tab, 11 ref.

Descriptors: *Groundwater, *Hydrogeology, *Oregon, *Maps, Hydrologic data, Water yield, Water quality.
Identifiers: *Grants Pass(Oreg), *Josephine County(Oreg).

Groundwater information is presented in a form that will enable water users near Grants Pass, Oregon to estimate the likelihood of obtaining groundwater in adequate quantity and suitable quality. The Grants Pass area is located in southwestern Oregon and has an area of about 270 square miles entirely within the Rogue River drainage basin and Josephine County. Alluvium is the major aquifer near the city of Grants Pass and along the Rogue River. Few yields are less than 5 gpm with 50 ft of drawdown; yields of 40 gpm with less than 40 ft of drawdown are not uncommon. Yields to wells drilled into conglomerate appear to

average somewhat less than yields from granitic rocks in the area. Granitic intrusive rocks of the Grants Pass batholith serve as aquifers in areas underlain by these rocks; a substantial part of the recent residential development has been in granitic areas. Well yields depend largely on the depth and degree of weathering and the extent of fracturing of the rocks--characteristics that have wide local variation. Well yields range from less than 1 gpm with several hundred feet of drawdown in some wells completed in 'tombstone granite' to at least 60 gpm with 50 ft of drawdown in a few wells where weathered or fractured zones are exceptionally well developed. Iron is excessive in some groundwater from the upper, weathered zone in granitic rocks or from alluvium that was derived mostly from granitic rocks. (Knapp-USGS)
W74-06959

QUALITY OF GROUND WATER IN THE LOWER COLORADO RIVER REGION, ARIZONA, NEVADA, NEW MEXICO, AND UTAH,
Geological Survey, Washington, D. C.
L. R. Kister.
For Sale by USGS, Washington, D. C. 20242, Price $1.00 per set. Hydrologic Investigations Atlas HA-478, 2 sheets, 1973. 3 fig, 2 map, 17 ref.

Descriptors: *Water quality, *Colorado River basin, Water chemistry, Salinity, *Maps, Hydrologic data, Hydrogeology.

Data are presented on the areal and vertical distribution of the dissolved-solids and fluoride concentrations in groundwater for the lower Colorado River region, an area of about 140,000 square miles in parts of Arizona, Nevada, New Mexico, and Utah. The basin and range province is characterized by isolated north to northwest-trending mountain ranges separated by broad alluvial-floored basins. The water in the mountains generally contains less than 1,000 milligrams per liter dissolved solids, except where water issues from saline springs. The dissolved-solids concentrations in the groundwater in the alluvium range from less than 100 to more than 100,000 mg/liter and generally are less than 1,000 mg/liter. The plateau uplands province includes a variety of landforms--canyons, buttes, mesas, and mountains. Although igneous and metamorphic rocks are the main rock types in the uplands, the sedimentary rocks form the most important aquifers. The dissolved-solids concentrations in groundwater vary areally and with depth and range from 90 to more than 60,000 mg/liter in about 1,500 samples analyzed. The principal constituents in the groundwater in the uplands are bicarbonate, sulfate, calcium, sodium, and chloride. The central highlands province forms a topographic high that separates the Plateau uplands from the Basin and Range lowlands in most of the lower Colorado River region. Volcanic rocks crop out in much of the area, are permeable, and water moves readily through them and recharges the underlying groundwater reservoir. Thin alluvial deposits in a few small valleys also store groundwater. Springs along the Mogollon Rim and elsewhere in the Central highlands are the source of the perennial flow in the Gila, Salt, and Verde Rivers. The groundwater generally contains less than 1,000 mg/liter of dissolved solids. However, several springs yield saline water to streams. (Knapp-USGS)
W74-06960

WATER RESOURCES OF NORTHWESTERN MISSOURI,
Geological Survey, Washington, D.C.
E. E. Gann, E. J. Harvey, and J. H. Barks.
For Sale by USGS, Washington, D.C. 20242, Price $1.50 per set. Hydrologic Investigations Atlas HA-444, 4 sheets, 1973. 26 fig, 7 tab, 48 ref.

Descriptors: *Water resources, *Missouri, Surface waters, Groundwater, Streamflow, Water yield, Water quality, Hydrogeology, Hydrologic data, *Maps.

A general summary is presented of information concerning the occurrence, availability, use, and quality of water in northwestern Missouri. Also included is a definition of problems and potentials which should be considered in the development of the water resources of the area. This atlas covers an area of approximately 13,000 square miles. The principal sources of fresh groundwater are the alluvium of the Missouri River valley, the alluvium of tributary valleys, and the outwash deposits in buried bedrock valleys. The existing drainage network has been developed on the unconsolidated materials overlying the buried bedrock valleys. Hydraulic connection between the alluvium of tributary valleys and the buried valleys is poor in most areas owing to relatively impermeable silt and clay deposits separating the two aquifers. However, toward the lower end of the Grand River valley the two aquifers may be connected. Artesian conditions exist in most of the buried valleys and in some areas in the Missouri River valley and tributary valleys. Water from bedrock aquifers in northwestern Missouri is generally too highly mineralized for most uses. The flow of streams in northwestern Missouri is highly variable. The average flow for a particular month may vary from year to year by a factor of 1,000. Minimum monthly mean flows of most streams in the area occurred during the severe droughts of the 1930's and mid-1950's. Maximum monthly mean flows generally occurred during the late-1920's, mid-1940's, and early-1960's. Flow-duration curves present general streamflow characteristics of streams in northwestern Missouri. Generalized estimates of average annual sediment yield are useful in the preliminary design of water resources projects. (Knapp-USGS)
W74-06961

STREAM TEMPERATURES IN WASHINGTON STATE,
Geological Survey, Washington, D.C.
M. R. Collings, and G. T. Higgins.
For sale by USGS, Washington, D.C. 20242, Price $1.00 per set. Hydrologic Investigations Atlas HA-385, 2 sheets, 1973. 11 fig, 1 tab, 7 ref.

Descriptors: *Water temperature, *Streams, *Washington, *Maps, Hydrologic data, Springs, Streamflow, Water quality, Urbanization.

Stream temperatures in Washington State are shown in this 2-sheet hydrologic atlas. The purpose of this study was to gain an understanding of the magnitudes, geographic distribution, and time variations in temperatures of streams in Washington, as defined by major drainage areas. The information provides a basis for evaluating the streams relative to their use for fish propagation, and for municipal, industrial, and agricultural supply. Data used included those from thermographs, once-daily observations, and intermittent temperature measurements. Of the data from intermittent temperature measuring sites, only those sites with at least 8 well-spaced measurements throughout the year (most sites had a greater number) were used. For the analysis all data for the period from January 1, 1960, through December 31, 1967, were used. Several streams have anomalous temperature patterns. Many of these temperature patterns are due to natural influx of hot or cold water from springs--flow from a warm spring affects temperatures at station 1123 in the Lower Columbia River drainage and a cold spring affects temperatures at station 1073 in the Puget Sound drainage. The influence of large groundwater inflow and the effect of urbanization are shown. (Knapp-USGS)
W74-06962

8. ENGINEERING WORKS

8A. Structures

COMPARISON OF STRENGTH TEST METHODS FOR CORRUGATED PLASTIC DRAINAGE TUBING,
Ohio State Univ., Columbus. Dept. of Agricultural Engineering.
F. I. Soribe, J. L. Fouss, and G. O. Schwab.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 3, p 445-447, May-June, 1972. 8 fig, 8 ref.

Descriptors: *Plastic deformation, *Plastic pipes, Closed conduits, Tile drains, Tiles, Subsurface drains, Pipes, *Strength.

The sand box and parallel plate methods for measuring the load deflection of corrugated plastic drainage tile were evaluated. Twelve-inch lengths of unslotted plastic tubing at a temperature of 72F and 50% relative humidity were tested using both methods. Deflection of the tubing was not allowed to exceed 5%. The load is linearly related to the deformation for deflections less than 5% in both test methods. Both methods give similarly accurate results. The parallel plate method is preferred because it is much faster to perform. (Skogerboe-Colorado State)
W74-06602

WOODCOCK CREEK LAKE, FRENCH CREEK BASIN, PENNSYLVANIA (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Army Engineer District, Pittsburgh, Pa.
Available from the National Technical Information Service as EIS-PA-73-0623-F $5.00 in paper copy, $1.45 in microfiche. January 1973. 49 p, 2 map.

Descriptors: *Environmental effects, *Reservoir construction, *Flood protection, *Dams, Flood control, Streamflow, Natural flow, Reservoir silting, Wildlife, *Pennsylvania, Turbidity, Impoundments, Surface waters.
Identifiers: *Environmental Impact Statement, Saeger Town and Meadville(Pa), *French Creek(Pa).

This project involves the further development of the coordinated French Creek Basin reservoir system by construction of a retention type dam on Woodcock Creek in Pennsylvania. The environmental impacts of the project include providing a higher degree of flood protection thereby creating an environment more favorable to economic stability; loss of part of the natural stream section, inundating several acres; providing a degree of stream flow management; and encouraging development of recreation in the project area. The major adverse environmental effects will be increased stream turbidity and siltation during construction. In addition, increased flood protection could encourage more extensive agricultural usage and development, thereby reducing the amount of land available for propagation of wildlife. (Daniels-Florida)
W74-06986

HURRICANE CREEK WATERSHED PROJECT, HUMPHREYS AND DICKSON COUNTIES, TENNESSEE (FINAL ENVIRONMENTAL IMPACT STATEMENT).
Soil Conservation Service, Washington, D.C.
For primary bibliographic entry see Field 4D.
W74-06988

NUTWOOD WATERSHED, ILLINOIS (FINAL ENVIRONMENTAL STATEMENT).
Soil Conservation Service, Washington, D. C.
For primary bibliographic entry see Field 4A.
W74-06990

8B. Hydraulics

HYDRAULICS OF A CENTER PIVOT SYSTEM,
South Dakota State Univ., Brookings. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 3F.
W74-06583

DESIGN CRITERIA FOR IRRIGATION SYSTEMS WITH COMPLEX PIPE LOOPS,
Nebraska Univ., Lincoln. Coll. of Engineering and Architecture.
For primary bibliographic entry see Field 3F.
W74-06585

HYDRAULIC ROUGHNESS OF CORRUGATED PLASTIC TUBING,
Guelph Univ. (Ontario). School of Engineering.
R. W. Irwin, and G. Tsang.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 2, p 290-291, 295, March-April, 1972. 3 fig, 1 tab, 10 ref.

Descriptors: *Plastic pipes, *Tile drains, *Subsurface drains, Hydraulic conduits, Closed conduits, Fluid friction, Hydraulic design, *Reynolds number, *Roughness(Hydraulic), Turbulence, Drainage.
Identifiers: *Corrugated plastic tubing.

The functional relationships between frictional factor, Reynolds number, and relative roughness are determined for corrugated plastic drainage tubing. All tubing used was unperforated 4-inch diameter. The test section was 50 feet in length minus 10 feet at the inlet and 5 feet at the outlet allowed for end effects. The tubing was maintained full at all flow rates. Friction factors for corrugated tubing are about twice as great for well laid tile. A single value to indicate pipe roughness for hydraulic design cannot be used for corrugated plastic tubing. A value specific to the tubing must be chosen. Plots of data obtained are included. (Skogerboe-Colorado State)
W74-06589

EFFECT OF ROUGHNESS ELEMENTS ON HYDRAULIC RESISTANCE FOR OVERLAND FLOW,
Soil Testing Services, Inc., Northbrook, Ill.
T. S. Kowobari, C. E. Rice, and J. E. Garton.
Transactions of the ASAE (American Society of Agricultural Engineers), Vol 15, No 5, p 979-984, September-October, 1972. 4 fig, 4 tab, 8 ref.

Descriptors: Hydraulics, *Open channel flow, *Manning's equation, Fluid mechanics, Open channels, *Hydraulic models, Head loss, *Roughness(Hydraulic).

Gradually-varied flow experiments were conducted in a 1.32 foot by 24 foot long test section of a 44 foot long WF steel beam channel. The bottom was lined with aluminum sheet material which was fitted with round aluminum pegs of sizes 3/32 in. and 9/32 in. diameters. The pegs, which served as roughness elements, were placed in the channel bed at definite longitudinal and transverse patterns and spacings. Under the bare channel lining condition, a maximum flow of 0.885 cfs was introduced into the channel. Test slopes for the adjustable slope channel were restricted to approximate values of 0.0025, 0.0050 and 0.010. The objective was to determine the relationship of Manning's resistance coefficient to size of roughness elements, pattern of arrangement, density of spacing, slope, and discharge in a smooth artificial channel using dimensional analysis and gradually-varied flow. High correlations between calculated and observed values of the resistance coefficient were obtained for all of the model equations. (Skogerboe-Colorado State)
W74-06594

SEASONAL CHANGES OF LITTORAL TRANSPORT AND BEACH WIDTH AND RESULTING EFFECT ON PROTECTIVE STRUCTURES,
Maryland Geological Survey, Baltimore.
For primary bibliographic entry see Field 2L.
W74-06664

DEVELOPING REGION IN SELF-AERATED FLOWS,
Karlsruhe Univ. (West Germany). Institut fuer Hydromechanik, Staunanlagen und Wasserversorgung.
K. K. Lai, and I. R. Wood.
Journal of the Hydraulics Division, American Society of Civil Engineers Vol 100, No HY4, Paper 10501, p 553-568, April 1974. 16 fig, 12 ref, append.

Descriptors: *Aeration, *Spillways, Reaeration, Open channel flow, Turbulent flow, Hydraulic models, Mixing.
Identifiers: Self-aerated flows.

A stuey of the effect of aeration on the spillway flow of a large dam was combined with a study of the region of developing self-aerated flow in a model flume. Using the model data as a basis, an analysis of the developing region treats the aerated layer independently of the underlying water layer and the physical conditions upstream of the critical point where aeration commences. On the basis of a comparison with the prototype data, a design method is presented for a portion of the developing, partially aerated region of spillway flows. (Knapp-USGS)
W74-06739

ON SQUIRE'S THEOREM IN THE STUDY OF HYDRODYNAMIC STABILITY OF PLANE-PARALLEL FLOWS OF INCOMPRESSIBLE FLUIDS ABOUT DEFORMING BOUNDARIES,
V. V. Skripachev.
Fluid Mechanics--Soviet Research, Vol 2, No 6, p 171-174, November-December 1973. 3 ref. (Originally published in Gidromekhanika, No 21, p 75-79, 1972.).

Descriptors: *Fluid mechanics, *Hydrodynamics, *Flow, *Stability, Boundary processes, *Boundaries(Surfaces), Boundary layers, Equations.
Identifiers: USSR, *Squire's theorem.

To determine the point of stability loss of a flow of a viscous incompressible fluid about deforming boundaries, three-dimensional disturbances must be calculated. The Squire theorem was found to be inapplicable for flow about deforming boundaries. (Josefson-USGS)
W74-06911

STRUCTURE OF THE VELOCITY PROFILE OF A SUSPENSION-BEARING FLOW,
Yu. K. Vitoshkin.
Fluid Mechanics--Soviet Research, Vol 2, No 6, p 27-32, November-December 1973. 2 fig, 11 ref. (Originally published in Gidromekhanika, No 18, p 72-76, 1971.).

Descriptors: *Fluid mechanics, *Flow, *Velocity, *Suspension, Mixing, Density, Equations.
Identifiers: USSR.

A formula is derived for constructing the velocity profile in a suspension-bearing flow by integrating the initial equation of the theory of turbulent mixing and by considering the nonuniform distribution of density of the mixture over the depth of flow. The method proposed for constructing the velocity profile of a suspension-bearing fluid yields satisfactory agreement with test data for various solid materials up to 2 mm in size. The method is substantiated by a comparison of the calculations with about 100 test plots. A comparison of some computed velocity profiles with test data is graphed. (Josefson-USGS)
W74-06912

DEGREE OF LOCAL SATURATION OF A FLOW BY SUSPENDED MATTER AND ITS RELATION TO THE VOLUME CONCENTRATION,
S. I. Kril', and E. L. Belilovskiy.
Fluid Mechanics--Soviet Research, Vol 2, No 6, p 6-11, November-December 1973. 3 fig, 10 ref. (Originally published in Gidromekhanika, No 18, p 54-59, 1971).

Descriptors: *Fluid mechanics, *Flow, *Suspended solids, *Saturation, Statistical models, Probability, Equations.
Identifiers: USSR.

The usefulness of setting up a statistical model of suspension-bearing flows on the basis of a discrete interpretation of concentration is demonstrated. An effective approximate method is considered for finding the distribution of the probabilistic content of suspended matter with height for the simple case of a plane-parallel, quasi-steady, and uniform suspension-bearing flow. A differential equation is obtained for determining the probabilistic concentration provided the volume concentration is known. A specific solution of the equation is found for two specific flow modes. (Josefson-USGS)
W74-06913

THE INFLUENCE OF CLAY FRACTION ON THE BASIC PARAMETERS OF THE HYDROTRANSPORT OF FINE FREE-FLOWING MATERIALS,
N. A. Silin, V. M. Karasik, and V. N. Kondakov.
Fluid Mechanics--Soviet Research, Vol 2, No 6, p 1-5, November-December 1973. 4 fig, 5 ref. (Originally published in Gidromekhanika, No 18, p 51-54, 1971.).

Descriptors: *Fluid mechanics, *Flow, *Sediment transport, *Suspension, *Clays, Sands, Particle size, Velocity, Friction, Density, Hydraulic gradient, Curves.
Identifiers: USSR.

The transport of fine sand was investigated in tailings from the Verkhnedneprovsk Metallurgical Combine (GOK). The tailings consisted of fine quartz sand (average diameter=0.25 mm) containing up to 7% of a clay fraction with an average diameter less than 0.0062 mm. The investigation was divided into two test series. In the first series, the hydraulic gradients and the velocities of the suspension-bearing flow at various average consistencies (densities) were measured during the motion of mixtures containing washed solid material (minus the finest fractions). In the second series, similar measurements were made with hydromixtures containing fixed amounts of an added fine fraction. Tests were initially run with the addition of clay particles to the suspension-bearing flow or additives from the GOK tailings. Later the same tests were run with additives of spondyloid clay (average diameter=0.06 mm). In all cases, the amount of clay particles in the flow at any hydromixture concentration was about 7% of the total amount of solid material. The coefficient of internal friction for washed sand was larger by a factor of 1.6 than that for sand containing 7% of clay particles. (Josefson-USGS)
W74-06914

DISTRIBUTION OF AVERAGE LONGITUDINAL VELOCITIES IN FLOWS WITH COARSE-GRAINED MATERIALS,
Yu. N. Krivenko.
Fluid Mechanics--Soviet Research, Vol 2, No 6, p 20-26, November-December 1973. 6 fig. (Originally published in Gidromekhanika, No 18, p 66-72, 1971.).

Descriptors: *Fluid mechanics, *Flow, *Velocity, *Coarse sediments, Particle size, Sediment transport, Pressure, Pipes, Cross-sections, Instrumentation, Measurement, Equations.
Identifiers: USSR.

Flows containing rolled material of fixed coarseness were investigated for distribution of average longitudinal velocities over the total area of a pressure flow containing particulate material. Materials measuring 0.5-1, 1-2, 1-3, 2-3, 3-5, 3-10, 5-10, and 7-25 mm were transported in a pipe 106 mm in diameter, and materials measuring 10-20 mm and 20-40 mm were transported in a pipe 206 mm in diameter. The ratio of soil volume in a compact body to volume of the hydromixture varied between 0.03 and 0.24. The instrument used to measure average longitudinal velocities and consistencies of hydromixtures over the total cross-sectional area of flow is diagrammed, and graphs show distribution of average longitudinal velocities over the vertical diameter of the flow cross-section and change in dynamic flow radius as a function of coarseness of flow of the material transported. (Josefson-USGS)
W74-06915

ENERGY LOSSES IN A TWO-PHASE FLOW CONTAINING COARSE-GRAIN MATERIAL,
Yu. N. Krivenko.
Fluid Mechanics--Soviet Research, Vol 2, No 6, p 12-19, November-December 1973. 4 fig, 3 ref. (Originally published in Gidromekhanika, No 18, p 59-66, 1971.).

Descriptors: *Fluid mechanics, *Flow, *Energy loss, *Sediment transport, *Coarse sediments, Particle size, Suspension, Resistance, Friction, Velocity, Pipes, Pipe flow, Equations.
Identifiers: USSR.

Energy losses in overcoming friction between solid particles and solid pipe-wall material are determined. The difference between total energy losses and work against these frictional forces is shown to be close to the energy losses in the flow of a pure fluid. A physical basis is presented for the method of calculating hydraulic resistances. (Josefson-USGS)
W74-06916

EFFECTS OF GROUND-WATER DEVELOPMENT ON THE PROPOSED PALMETTO BEND DAM AND RESERVOIR IN SOUTHEAST TEXAS,
Geological Survey, Austin, Tex.
For primary bibliographic entry see Field 4B.
W74-06920

8D. Soil Mechanics

QUASI-CONTINUOUS EXPLOSIVE CONCEPTS FOR HARD ROCK EXCAVATIONS,
Shock Hydrodynamics. Sherman Oaks, Calif.
For primary bibliographic entry see Field 8H.
W74-06860

LOWER KLAMATH RIVER FLOOD CONTROL PROJECT, DEL NORTE COUNTY, CALIFORNIA (FINAL ENVIRONMENTAL IMPACT STATMENT).
Army Engineer District, San Francisco, Calif.
For primary bibliographic entry see Field 4A.
W74-06989

8H. Rapid Excavation

THE CHALLENGE OF MILITARY NUCLEAR CONSTRUCTION,
Army War Coll., Pa. Carlisle Barracks, Pa.
B. C. Hughes.
Aval: NTIS, Springfield, Va., as AD-764 601. $5.45 per copy, $1.45 microfiche. March 8, 1972. 75 p, 16 fig, 3 tab, 1 bib. of 14 ref.

Descriptors: *Nuclear explosions, Civil defense, *Construction, Craters, Excavations, Nuclear engineering, Seismic waves, *Radioactivity, Fallout, Reserach and development, Economics, Technology, Testing, Safety, *Safety factors, Canal construction, Dam construction, Road construction, Harbors, Beneficial use, Cost-benefit theory, *Military aspects.

Rationale is provided to support the initiation of a comprehensive program for the development of the capability to use nuclear construction techniques in support of military operations. This military capability which has the potential for providing significant savings in manpower, time, and funds could be developed as a follow-on of the research and development accomplished to date for civil applications. The nuclear construction research programs of both the US and USSR are described in detail with emphasis on the nuclear and chemical cratering experiments that have been conducted and the technology which has been developed. A discussion of the hazardous safety effects resulting from a nuclear cratering detonation is included together with a description of the techniques which have been developed to control these effects and preclude personnel injuries. Potential military construction applications include nuclear quarries, harbors, roadway cuts, and inland canals. It is recommended that the Department of the Army develop and incorporate in its doctrine the use of nuclear construction techniques in support of military operations. The foregoing embodies a broad concept of peaceful uses of atomic energy, many of which have been developed through the plowshare program by the USAEC. (Houser-ORNL)
W74-06859

QUASI-CONTINUOUS EXPLOSIVE CONCEPTS FOR HARD ROCK EXCAVATIONS,
Shock Hydrodynamics. Sherman Oaks, Calif.
N. A. Louie.
Available from the National Technical Information Service as AD-765 792 $3.50 in paper copy, $1.45 in microfiche. Final Report, June 1973. 57 p, 18 fig, 9 tab, 6 ref, append. ARPA Contract H0220026.

Descriptors: *Excavation, *Rock excavation, *Explosions, Explosives, Project feasibility, Craters, *Rock mechanics, Granites, Concretes, Engineering, Geology, Apparatus, Machinery, Engineering structures, Hydrodynamics.
Identifiers: *Projectiles, Pulsed explosions.

The use of continuous or quasi-continuous systems for pulsed explosion rock excavation, can have major advantages over conventional methods. The feasibility and applicability of such an explosive system concept are discussed. The optimum properties of the explosive system, the effectiveness of the explosive-rock interactions, and the interactions between successive explosions were determined in tests on granite and concrete. A prototype multiple charge launcher was designed, built and tested to demonstrate the feasibility of a multiple feed system. The quasi-continuous explosive projectile launcher appears to be capable of unusually high drilling rates into hard rock. Recommendations are made for application of the launcher system to actual hard rock excavation conditions. An appendix gives details of apparatus and machinery. (Houser-ORNL)
W74-06860

8I. Fisheries Engineering

OXYGEN IN ESTUARIES: REQUIREMENTS FOR FISHERIES,
Water Pollution Research Lab., Stevenage (England).
For primary bibliographic entry see Field 5C.
W74-06542

THE EFFECTS OF ECOLOGICAL CHANGES ON BUCKEYE LAKE, OHIO, WITH EMPHASIS ON LARGEMOUTH BASS AND AQUATIC VASCULAR PLANTS,
Bureau of Sport Fisheries and Wildlife, Washington, D.C.
For primary bibliographic entry see Field 5C.
W74-06546

MACROBENTHOS OF PONDS WITH SUGAR FACTORY WASTES,
Polish Academy of Science, Krakow. Zaklad Biologii Wod.
For primary bibliographic entry see Field 5C.
W74-06553

RELATIVE RECOVERIES OF HATCHERY-REARED LANDLOCKED SALMON PLANTED AT DIFFERENT AGES AT SCHOODIC LAKE, MAINE,
Maine Dept. of Inland Fisheries and Game, Machias.
K. A. Havey.
Trans Am Fish Soc. Vol 102, No 1, p 121-124. 1973.
Identifiers: Ages(Fish), Lakes, *Maine(Schoodic Lake), Salmo-salar, *Salmon, *Fish hatcheries.

Relative recoveries of landlocked salmon Salmo salar planted at ages 0+ (fall), I (spring) and I+ (fall) were compared by analysis of variance and a multiple range test. Data were collected from angler catches (1963-1969) and from trap net catches (1963-70). Sample sizes were 987 salmon from angling and 1018 salmon from netting. The analysis of variance revealed a significant difference in recoveries of salmon of different ages at planting, and the Student-Newman-Keuls multiple range test showed that the significant difference was between age 0+ and age I+ salmon. At Schoodic Lake, Maine, comparable sport fisheries could be provided by stocking either 1000 age I+ salmon or 2800 age 0+ salmon. The smaller salmon would cost only 70% as much as the larger.--Copyright 1973, Biological Abstracts, Inc.
W74-06865

LEGAL IMPEDIMENTS TO THE USE OF INTERSTATE AGREEMENTS IN COORDINATED FISHERIES MANAGEMENT PROGRAMS: STATES IN THE N.M.F.S. SOUTHEAST REGION,
Louisiana State Univ., Baton Rouge. Law School.
For primary bibliographic entry see Field 6E.
W74-06991

AN EVALUATION OF STRIPED BASS FINGERLING CULTURE,
Wayne Community Coll., Goldsboro, N.C.
E. T. Humphries, and K. B. Cumming.
Trans Am Fish Soc. Vol 102, No 1, p 13-20, 1973. Illus.
Identifiers: *Bass(Striped), Cladocerans, Copepods, *Cultures, Diet, Fingerlings, Insects, Morone-Saxatilis, Predation, *Fish hatcheries.

A synopsis of investigations concerned with culture of striped bass (Morone saxatilis, Walbaum) fingerlings is presented. An historical review of significant events includes the development of hatcheries and rearing techniques. Changes in food habits and feeding occur with early development of the fish. Early instars of copepods and cladocerans are preferred natural foods until the fish are about 10 mm in total length. The diet of fish in the 10-30 mm size group consists mainly of adult copepods supplemented with some caldocerans and insect larvae. Fish in the 30-80 mm size group utilize fewer copepods while cladocerans and insect larvae make up the major

portion of the diet. Insect larvae are the most important foods of fish in the 80-100 mm size group. A comparison of first yr growth rates of pond-reared striped bass with those sampled from natural waters on the mid-Atlantic Coast indicates that both groups of the fish grow at approximately the same rate for the first 30 days, after which the pond-reared fish grow much faster. Striped bass reared in ponds are approximately 170 mm in length at the end of the first yr while those in natural waters are about 110 mm long. Factors affecting growth and survival of young striped bass include predation, handling, stress, and various water quality factors. The future outlook for fingerlings culture includes the development of hatcheries, nursery ponds, and intensive culture techniques.--Copyright 1973, Biological Abstracts, Inc.
W74-07002

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

NINTH ANNUAL REPORT OF THE OKLAHOMA WATER RESOURCES RESEARCH INSTITUTE, FISCAL YEAR 1974.
Oklahoma Water Resources Research Inst., Stillwater.
Available from the National Technical Information Service as PB-231 271; $8.00 in paper copy, $1.45 in microfiche. Institute Annual Report, Part 1, 1973. 91 p.

Descriptors: *Water resources institute, *Oklahoma, Water resources research act, Universities, Contracts, Grants, Eutrophication, Thermal stratification, Groundwater.

This is the 9th annual report of the Oklahoma Water Resources Research Institute. The most pressing water problems of the State continue to be in water resources planning. Oklahoma is mining water from the Ogallala Aquifer at a rate far in excess of natural recharge. The irrigated farming of Oklahoma's high plains is dependent upon a diminishing supply of groundwater. This and other groundwater problems (surface subsidence and groundwater pollution) are currently being discussed at a series of regional conferences sponsored by the OWRR and the regional Institute directors. For the past several years, the Institute and affiliated university researchers have been studying the effect of eutrophication and summer stratification on the water quality and ecosystems of lakes and reservoirs. A reliable method of lake destratification can be developed economically and be used effectively on the largest of lakes. While large reservoirs can be prevented from undergoing the usual summer stratification, the ecological advisability of doing so must be determined. The rewards of destratification (or the prevention of stratification) include enhanced water quality and the slowing or even the reversal of the eutrophic process. (Knapp-USGS)
W74-06515

INVENTORY OF ACTIVE WATER RESOURCES RESEARCH PROJECTS IN NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
For primary bibliographic entry see Field 9D.
W74-06615

WATER RESOURCES RESEARCH INTERESTS IN THE COLLEGES AND UNIVERSITIES OF NORTH CAROLINA.
North Carolina Water Resources Research Inst., Raleigh.
Available from the National Technical Information Service as PB-231 346, $3.75 in paper copy, $1.45 in microfiche. Report No. 3 (Revised), (UNC-WRRI-73-03), Jan. 1, 1974, 59 p. OWRR A-999-NC(36).

Descriptors: *North Carolina, *Universities, *Colleges, Research and development, *Education, Research priorities, Census.
Identifiers: *Research interests(Education).

An inventory is presented of water-related research interests in the following North Carolina colleges and universities: North Carolina State University at Raleigh; University of North Carolina at Asheville; University of North Carolina at Chapel Hill; University of North Carolina at Charlotte; University of North Carolina at Greensboro; University of North Carolina at Wilmington; Appalachian State University; North Carolina Agricultural and Technical State University; North Carolina Central University; Pembroke State University; Western Carolina University; Campbell College; Duke University; Guilford College; Livingstone College; Mars Hill College; St. Andrews Presbyterian College; St. Augustine's College; and Warren Wilson College. (Howells-North Carolina State)
W74-06616

ANNUAL REPORT, FY 1973.
North Carolina Water Resources Research Inst., Raleigh.
Available from the National Technical Information Service as PB-231 308, $4.00 in paper copy, $1.45 in microfiche. Report WRRI-UNC-73-00, (1973), 74 p. OWRR A-999-NC(38). 14-31-0001-3833.

Descriptors: *Water Resources Research Act, *Education, *Water Resources Institute, *Universities, Colleges, Training, *North Carolina, Projects, *Research and Development, Grants, Contracts.

The Water Resources Research Institute is The University of North Carolina's water research center. Located at N.C. State University at Raleigh, the Institute serves all sixteen campuses of The University of North Carolina System. It works closely with the Department of Natural and Economic Resources and other agencies in the formulation of a research program responsive to State water resource problems. A 27-man Advisory Committee representative of State and federal water agencies, industry, conservation, agriculture, local government, and the general public provides program guidance and review. The Institute's research program for FY 1972-73 was supported by an annual allotment and 10 matching grants from OWRR, USDI; a grant from the EPA; matching State appropriations; matching funds from Texas Gulf Sulphur Corp.; a grant from Z. Smith Reynolds Fdn.; and a grant from the Office of Water and Air Resources, NCDNER. All senior colleges and universities in North Carolina are eligible to participate in the Institute's program. During FY 1972-73, projects were conducted at N.C. State University, University of North Carolina at Chapel Hill, University of North Carolina at Charlotte, Duke University, and East Carolina University. (Howells-North Carolina State)
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A. Centers of Competence		
AEC Oak Ridge National Laboratory, Nuclear Radiation and Safety	W74-06815 -- 06826 06855 -- 06862	20
Battelle Memorial Institute, Methods for Chemical and Biological Identification of Pollutants	W74-06745 -- 06755 06757 -- 06765 06866 -- 06878	33
Colorado State University, Irrigation Return Flow Quality	W74-06580 -- 06602	23
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University of Wisconsin, Eutrophication	W74-06529 -- 06530 06533 -- 06547 06549 06551 -- 06576 06742 -- 06744	47
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U. S. Geological Survey, Hydrology	W74-06515 -- 06516 06619 -- 06740 06879 -- 06926 06928 -- 06962	207
Vanderbilt University, Metals Pollution	W74-06766 -- 06767 06769 -- 06814	48
B. State Water Resources Research Institutes		
California Water Resources Center	W74-06608, 06843 06996	3
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New York Water Resources and Marine Sciences Center	W74-06614, 06835 06848 -- 06849	4
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Utah Center for Water Resources Research	W74-06506	1
West Virginia Water Research Institute	W74-06507	1
Wisconsin Water Resources Center	W74-06836	1
C. Other		
BioSciences Information Service	W74-06531 -- 06532 06548, 06550 06741, 06756 06768, 06865 06927 07001 -- 07050	59
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CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.

Subject Fields

1 NATURE OF WATER

2 WATER CYCLE

3 WATER SUPPLY AUGMENTATION AND CONSERVATION

4 WATER QUANTITY MANAGEMENT AND CONTROL

5 WATER QUALITY MANAGEMENT AND PROTECTION

6 WATER RESOURCES PLANNING

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